THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXV. No. 893.] LONDON, JUNE 22, 1880. [32ND YEAR. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
ERITH,
OFFICES:
2, CROSBY SQUARE,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

TUBES.
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.
JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & CO. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
MANUFACTURERS OF
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.

See Page 958.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

GEORGE GLOVER AND CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS.
GOLD MEDAL. HIGHEST AWARD.

INTERNATIONAL EXHIBITION,
SYDNEY, 1880.
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.
1, LANCASTER AVENUE, MANCHESTER.
Foreign Agents: DAHL BROS., Copenhagen; A. FAAS & CO., Frankfort-on-Maine; W. HOVEN & SON, Rotterdam; COPLAND & M'LAREN, Montreal; A. DEMPSTER, 57, Elizabeth Street, Melbourne.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

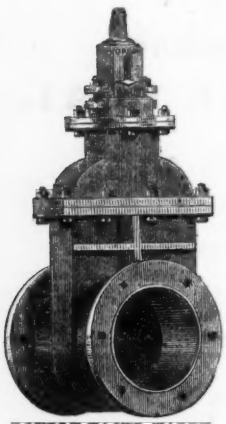
GAS APPARATUS;

CONTRACTORS FOR THE

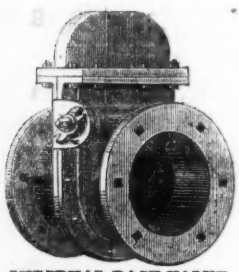
ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

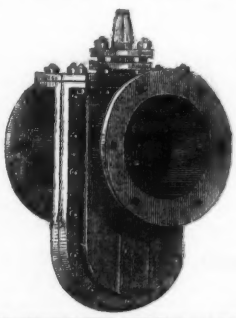
C. & W. WALKERS' GAS-VALVES.



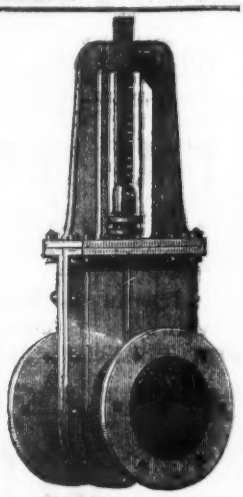
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES. 57, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,

ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

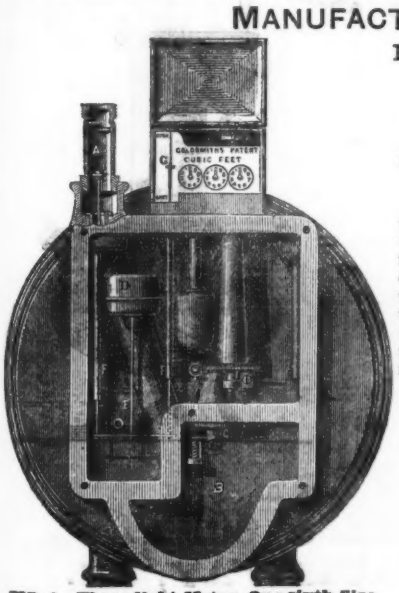


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

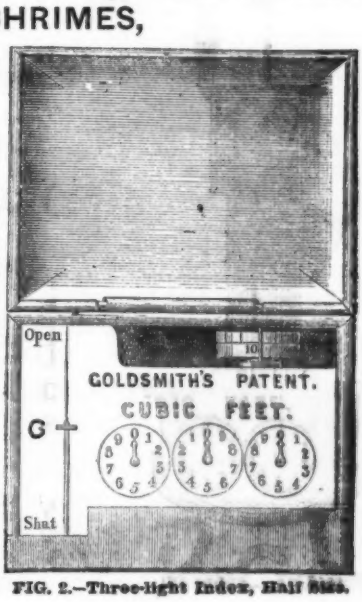


FIG. 2.—Three-light Index, Half Size.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

MECHANICAL CONDENSATION.

The undersigned has arranged with Messrs. Pelouze and Audouin the exclusive agency for their patented system of Condensation, in Great Britain and the Colonies.

The following are some of the advantages which this philosophic mode of arresting liquefiable vapours possesses:—

1. It acts irrespective of temperature.
2. It requires no motive power, but automatically adapts itself to production.
3. It may be fixed directly after the hydraulic main, by which prolonged contact of the gas with tar is avoided, and the highest standard of illuminating power is obtained which the coal is capable of giving; or it may be fixed directly after an ordinary air condenser, when it will arrest the vapoury globules which cooling alone will not stop, and the production of tar and ammonia water is thereby increased.
4. It effects a considerable saving in purification, through no tar getting to the material to clog its action.
5. It entirely supersedes the necessity of scrubbers; and if wet sawdust be used in a purifier, washers also are unnecessary.
6. It occupies but little space, and avoids that which is now considered a disadvantage—the too much cooling, scrubbing, and washing of gas.

Further particulars may be obtained of

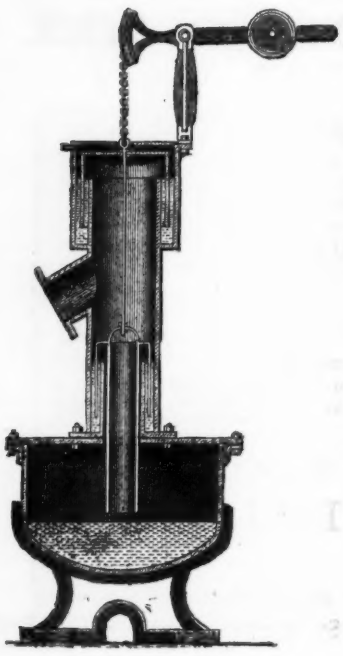
GEO. BOWER, St. Neots, Hunts.

NOTE.—*Gas-works contracted for complete, or apparatus supplied in detail from the retort to the burner. "The Gas and Water Engineer's Book of Reference," post free, 5s. "Handy Abstract of the Public Health Act, 1875," post free, 1s.*

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

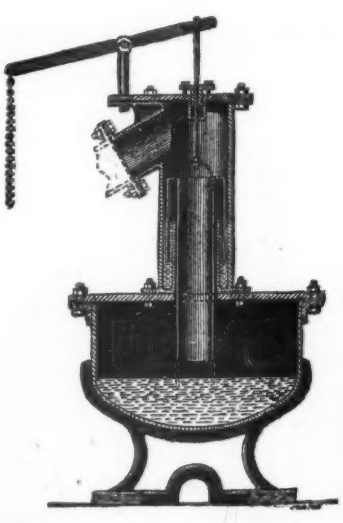
Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,

(Signed) W. CRICKMAY,
Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months.

It requires very little attention, and cannot get out of order.

These Machines, which contain from 3200 feet to 65,000 feet of Wetted Surface, are supplied to the following Gas-Works:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
„ „ Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

And many in course of Construction, among others—

Feet per Day each.	For	Feet per Day each.	For
Four for 3,000,000	Corporation of Leeds.	One for 1,000,000	West Bromwich Improvement [Commissioners.
Three „ 1,750,000	Corporation of Salford. [Station.		
One „ 2,500,000	The Gaslight Co., Shoreditch	One „ 750,000	Radcliffe and Pilkington Gas Co.
Two „ 1,250,000	The Gaslight Company, Beckton.	One „ 500,000	Oldbury Local Board.
One „ 3,000,000	London Gas Co., Nine Elms.	One „ 150,000	Falmouth Gas Company.
One „ 1,250,000	Corporation of Nottingham.	One „ 250,000	European Gas Company, Rouen.
One „ 2,000,000	Cheltenham Gas Company.	One „ 200,000	Deal Gas Company.

TESTIMONIALS.

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June 8, 1880.*

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor, and the second with water. Of course the fact of our having ordered two more in addition to the four which we have in use is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug. 12, 1879.*

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free), obtained from a large number of tests, was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works.

(Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

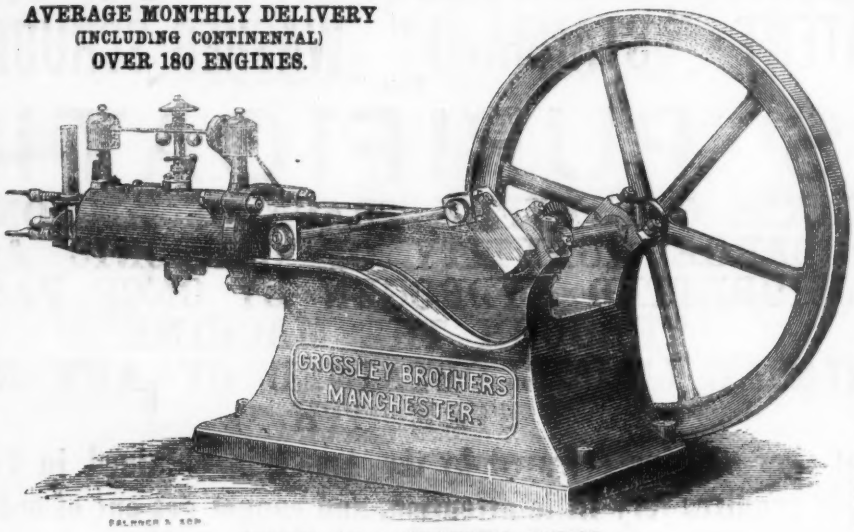
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

These Engines are used at the following Gas-Works:—Birmingham, Brentford, Bucharest, Bishop Stortford, Driffield, Dundalk, Dundee, Dublin, Huddersfield, Hinckley. London—London Gas-Works, Phœnix Gas Co., Gaslight and Coke Co., South Metropolitan Gas Co., Commercial Gas Co., Crystal Palace District. Leominster, Edinburgh and Leith, Ludlow Union, Lancaster, Maidstone, Nuneaton, Northampton, Shanghai, Sheffield, Worcester, Wantage, &c.

AVERAGE MONTHLY DELIVERY
(INCLUDING CONTINENTAL)
OVER 180 ENGINES.



Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE,

From ½ to 40 Horse Power Indicated.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES.

WORKS AND HEAD OFFICES:
Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS,

MANCHESTER.

LONDON HOUSE:
116, Queen Victoria St., E.C.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

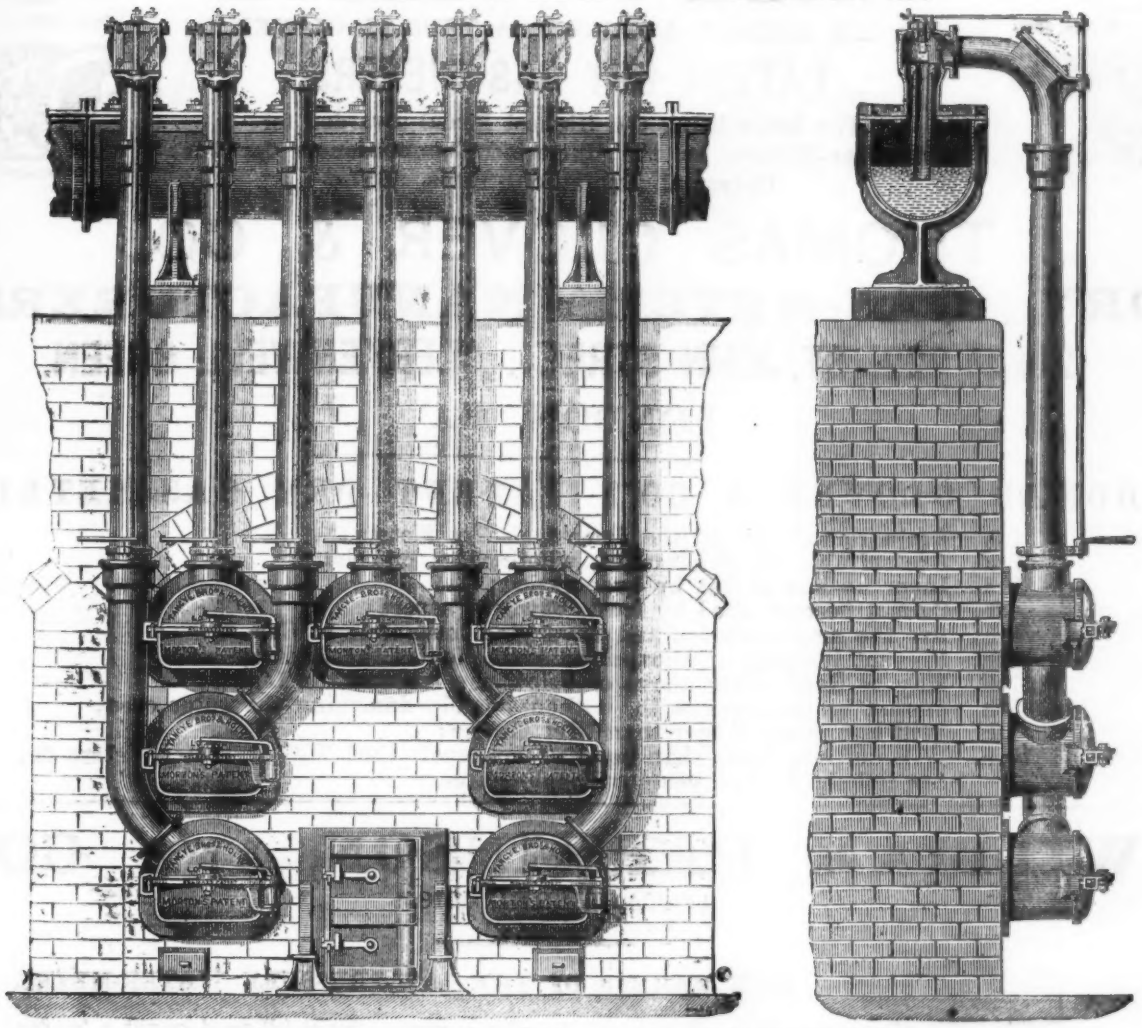
WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, beause the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

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London, 1851 New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

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(ESTABLISHED 1816.)

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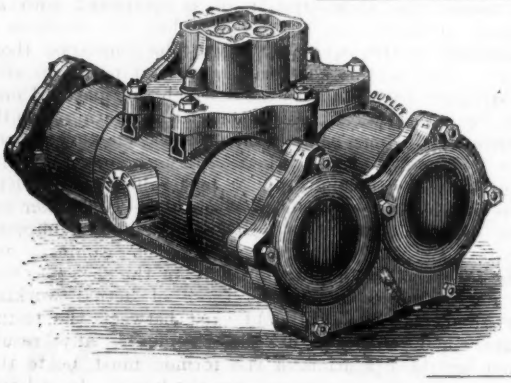

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ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 22, 1880.

Circular to Gas Companies.

CONTINUING our notice of the proceedings at the recent meeting of the British Association of Gas Managers, we have to-day to deal with the first five papers read—the sixth, that by Mr. G. E. Stevenson, on the question of publishing comparative working statistics, we commented upon in last week's "Circular," and have nothing further at present to add to the remarks we then made.

Mr. Travers's paper on the Thermal Power of Gas Cooking Stoves, published last week, was chiefly noticeable, apart from the painstaking of the author which was manifested in its preparation, for the surprising way in which it exhibited the inefficiency of much of the apparatus that is sold at the present day for the utilization of gas as fuel for cooking and heating. Mr. Travers was commendably careful in preparing the gas which he used for his first experiments, in order to get a comparison between the heating power of gas from various kinds of coal, of different value as regards illuminating power; but the special requirements of the case did not apparently warrant the more exhaustive analysis which would have helped to distinguish the samples with greater relevance to the purpose for which they were required. And we are not sure that the heating power of gases of different specific gravity can be fairly tested with the same burner. Mr. Travers was only able to get the low result of 244 units per cubic foot with a ring atmospheric burner, of the kind so generally supplied with the usual cooking-stoves, while with a higher form of burner he obtained 580 units out of the same quantity of gas of equal power. Mr. F. W. Hartley subsequently stated that he had himself obtained 626 units with Nottingham gas, which was a result with which he appeared tolerably well satisfied. Now, comparing Mr. Travers's highest result with his lowest, it will be observed that the unfortunate user of the worst burner would have to pay nearly two and a half times as much as the happy possessor of the better apparatus for the same amount of work; and would, consequently, be a less enthusiastic believer in gas cookers generally. It speaks well for the advantages of gas for cooking and heating, that even when so heavily handicapped with wasteful appliances, got up by manufacturers, whose sole aim has been to provide a showy article at a low price, it should still have made such headway as it has. It is, however, quite certain that rubbishy stoves and heating burners, not always low priced, have done an incalculable amount of harm in hindering the rapid extension of gas for other than lighting purposes; people who have once been deceived in this way having been made incredulous of benefits derivable from its use.

Mr. Travers touched upon a subject which has attracted a considerable amount of attention, and upon which the last word has yet to be spoken, when he hinted at the practicability of making gas of good heating power, but of low illuminating value, to be used for both purposes, subject to carburetting when intended for the latter application. The gas referred to can be easily produced, but the carburetter is not as yet in existence, although it is not an impossibility, and we may yet live to see it in the power of the consumer to regulate the illuminating value of his gas as easily as he now can its quantity.

In the discussion that followed the reading of the paper, Mr. Hartley gave some exceedingly interesting facts respecting the heating power of gas, which he had ascertained from his own experiments; and the careful manner in which Mr. Hartley is known to make his observations lent additional value to his remarks. The very simple apparatus described by Mr. Vernon Harcourt, as constructed under his directions, for keeping frost out of greenhouses, by the heat of the products of combustion of a small gas-flame, was a fitting addition to the information given on the subject of the paper by the author, Mr. Hartley, and others, and we are convinced that heating apparatus of this kind needs only to be known to be appreciated, and the principle involved may, with every chance of success, be applied in very much larger apparatus than Mr. Harcourt described.

Mr. Harrison Veevers's paper on Testing Gas Coals and Cannels, which appears in another part of this week's issue, was substantially an account of the author's examinations of various descriptions of the raw material which he had had submitted for his own use at Dukinfield, and the actual results were consequently chiefly of local interest, although the importance of the subject in its general application was evidenced by the long discussion which followed the reading of the paper, and which was confined almost entirely to the method of testing adopted by the author, without much reference to the examples treated thereby. Some exception was taken, and, as it appears to us, with considerable force, to the author's plan of testing the illuminating power of the gas at certain intervals, in connection with the quantity given off from the retorts between the same periods of time. While acknowledging the fact that much valuable information respecting the quality of the gas being made at the precise moment when the photometrical observations are taken may be obtained in this way, it is evident that a mean of such observations, even if the varying quantities of gas produced between the regular intervals before mentioned be also taken into account, cannot give a reliable average value for the gas so produced when stored in bulk. Mr. Veevers contends that his method is independent of a gasholder, and can therefore be used when other methods which involve the use of the latter cumbersome apparatus are unavailable. But this contention does not touch the main question, which is whether any method of testing the gas obtained from a given weight of coal, other than in bulk, is competent to give data really worth having. Testing gas, in the sense commonly understood in the profession, consists in obtaining definite results of the nature of such as are arrived at in actual working, from the material examined. This is a very different thing from the process known to chemists as analysis, which means the disintegration of a compound into its component elements; or, sometimes, when the analysis is not required to be exhaustive, into the forms of those elements. This is almost invariably effected by means altogether different from any treatment which the material may receive for its practical and economical separation into the same elements. Hence the practice has become very general for gas managers to "test" their coal, as a means of estimating its value supplementary or preferably to the stricter analysis which goes to show, not what the gas maker can get out of it, but of what it is fundamentally composed. But it is plain that the former method of examining coal depends for its value simply and solely on the closeness with which its conditions conform to those of actual working. If any great discrepancy should exist between the testing apparatus and the working arrangements, any results obtained by the operation of the former must be to that extent inapplicable as a gauge for the latter. In ordinary working, the gas from many retorts in all stages of carbonization, some newly charged and others nearly worked

off, is intimately mixed in every stage of its passage to the holder, and is there allowed to stand long enough for the attainment of equality in constitution, in which state it is eventually consumed. With these considerations in view, it is difficult to see how any method of testing which ignores the holder can be anything more than curious for comparison among its own results, and for the lessons it may thereby indirectly teach. Thus, Mr. Veevers's method may be taken as a means of estimating the effects of heat in retorts, quite as well as for its ostensible purpose; indeed, considerable evidence of this was offered by the author himself, in his explanation of the two first examples given in the table of illustrations which accompanied the paper. Conspicuous proof was certainly afforded, by the results given in this table, of the permanent necessity for ascertaining the temperature of gas-retorts generally —but more especially experimental retorts—in order that a definite idea may be formed of the true practical value of the coal carbonized therein. The method of measuring the temperature as subsequently described by Mr. Sugg, by plunging blocks of cast iron, previously heated in the retorts, into water, and noting the rise of temperature of the water, is capable of determining this particular point with sufficient accuracy for all practical purposes, and is very easy of application. Again, if the advantages of high heats and short charges had needed further confirmation, it might be found in Mr. Veevers's experiments, wherein this lesson also appears to lie on the surface. Mr. Hunter, of Stalybridge, is of opinion that the illuminating power of the gas evolved at the end of the second hour from retorts filled with a six-hour charge, is a good average indication of the quality of the whole. This probably means that at this time the coal is thoroughly and equably heated, and has attained its maximum expansion, so that the major portion of its volatile constituents are then being given off, the most volatile hydrocarbons having already gone. This observation is interesting, so far as it goes; but much must depend on the heat of the retort, which, however, is indicated to some extent by the condition stated by Mr. Hunter—that it should be capable of working off a six-hour charge.

A good number of speakers joined in the discussion, but a general impression might be gathered from the statements made, that methods of testing primarily intended to guide individuals as to the results they should expect in practice, are apt to imitate the defects as well as the advantages of practical work, and to that extent may not be strictly comparable one with another. For instance, a bad experimental apparatus for making gas might be actually excelled by some full-sized works, while considerations which need not be detailed might render nugatory the results of others. Hence it might be inferred that nothing short of ultimate analysis, conducted by a trustworthy chemist, is at all reliable, and that having obtained a certain statement of this kind, it should be left to practical men to approach it as nearly as they can. But, unfortunately, the illuminating power of a coal or cannel is only to be satisfactorily determined by actual inspection, and for this purpose the gas must be produced and consumed in the prescribed manner. Perhaps, after all, some generally acceptable results might be secured by a modification of the method advocated by Mr. Carr and other speakers, wherein the value of the gas produced in experimental retorts at a stated temperature—say, 2000° Fahr.—should be determined with reference to both quantity and illuminating power, and the residual products should also be valued, not omitting a record of the impurities in the gas and the percentage of ash in the coke. Then if—and it is, of course, a very large "if"—the apparatus employed is in perfect order, and all possible care be taken in the manipulation, no such glaring discrepancies as we now meet with in the recorded tests of the same description of coal should be possible, or, if occurring, it would only be in such circumscribed limits as would render discovery of the disturbing cause much easier of attainment.

The use of gaseous fuel for heating gas-retorts was, perhaps, the most practical subject which occupied the attention of the late meeting, and the manner in which it was brought forward by Mr. F. Livesey and Mr. G. E. Stevenson in their respective papers, and subsequently treated by the various speakers who took part in the discussion, left nothing to be desired. Unless appearances are very deceptive, this is a matter which has now taken firm hold of the gas engineers of the United Kingdom, and the day cannot be distant when the reproach of being so far behind their continental brethren in this respect will no longer apply to them in the same degree as at present. Mr. Livesey's communication was particularly interesting, as it described some experiments on a working scale which have been carried on at the South Metropolitan Gas-Works, and which go to show that the first principles of the Siemens furnace having been clearly understood, it is comparatively easy to construct modified furnaces in accordance therewith, which shall meet the peculiar requirements of almost any kind of retort-setting. In fact, when once the besetting causes of failure have been carefully guarded against—and this is by no means difficult—it is quite as easy to construct a gas generator as an ordinary furnace. While Mr. Livesey recounted how he had succeeded by working on independent lines, profiting, of course, by the example of those investigators who have preceded him, Mr. Stevenson gave a narrative of how Herr Liegel, who was one of the earliest workers in this field, constructs the newest generators which bear his name. Mr. Livesey explained how easily the desired effect may be produced, and Mr. Stevenson showed one of the most perfect appliances now used for the same purpose; and thus the beginning and the end of effort were placed before the meeting in instructive juxtaposition.

The central principle of gas generator furnaces—the combustion of fuel to carbonic oxide, and the subsequent ignition of this inflammable gas in the retort furnace—needs no further explanation than has been already given in these columns and elsewhere; but there appeared to be some difficulty, on the part of several of the speakers, in comprehending the reasons why it has been found advantageous in practice to produce and consume this particular compound of carbon and oxygen, instead of burning the fuel directly to carbonic acid in the usual way; more particularly as it is well known that the production of the latter compound is attended with the evolution of higher thermal power from the fuel employed than the former. This is partly to be accounted for by the fact mentioned by Mr. Stevenson, that such an excess of air must, in practice, be brought into contact with any kind of solid fuel, in order that no part of its bulk may escape exposure to oxygen, that the resulting heat is enormously diluted by the means adopted to cause its development; whereas two gases such as carbonic oxide and air may be made to combine in proportions almost confined to the requirements of theory, and this great advantage more than balances the higher value possible, but never really obtained in the other case. But in addition to this circumstance, which may be called a practical drawback, conceivably removable by improvements in appliances for the use of solid fuel, the local intensity of the combustion of carbonic oxide—that is to say, the temperature which it immediately imparts to the products of its combustion with atmospheric air—is really higher than that given in the direct formation of carbonic acid, for the reason that the bulk of its combustion products is less, and their temperature is correspondingly increased. Another reason for the advantages found to accrue from the use of gaseous fuel, in retort-settings especially, is found in the fact that the heating flame itself is actually in contact with the retorts, and practically envelopes them in a sphere of the most intense ignition, and this continuously; there being no necessity for periodically exposing the interior of the setting to cold air, as with the direct-acting furnace, and thus the utmost regularity in working is readily attainable.

There was much to be learnt by the direct comparison of Mr. Livesey's designs with Herr Liegel's arrangement. In the first place, in all furnaces which generate carbonic oxide there must be a region where the air is first admitted, in which the ignition is extremely violent; so much so as to fuse any brickwork thereabout, unless it be highly refractory, or unless special means be provided for reducing the temperature. Again, the slag or clinker which is formed in the generator must be got rid of; and these two considerations are treated together in all generators, but not by any means in the same way. Herr Liegel faces this difficulty of the fusing of the brickwork by using specially made blocks of the most refractory material obtainable, and then utilizes the intense heat for fusing the clinker, in order that it may run out of the generator; so that, provided he can get his blocks to stand, the high temperature of the primary ignition is rather an advantage to his system than otherwise. It is, however, evident that some nicety of management is required to effect the regular fusion of the clinker, and yet avoid destruction of the brickwork. It is only fair to Herr Liegel to say that he claims that there is no difficulty in doing this; but Dr. Siemens, the eminent introducer of these furnaces, himself acknowledged having met with considerable trouble in the attempt, eventually abandoning it in favour of the plan adopted in Mr. Livesey's furnaces, which consists in admitting water or steam with the air, in such quantities that the ignition temperature is lowered

by the abstraction of the heat necessary to decompose the water, the effect being that while the brickwork is protected, the clinker does not form masses by partial fusion, but is readily removable in small pieces, and the excess of heat, transported from the place where it is not required by the aqueous vapour which it reduces to its elements, is reproduced in the proper place when the resultant hydrogen is burnt with the carbon gas in the retort-setting. Herr Liegel makes a point of "stepping" the brickwork in the interior of the generator, in order to stop the air from creeping up by the walls instead of permeating the mass of fuel; while Mr. Livesey, having commenced with stepping, proposes to discard it in future, as he finds that the interior soon became smooth with ordinary wear; this is, of course, similar to what is observable in ordinary furnaces, but it somewhat demolishes Herr Liegel's claims in this particular respect.

One of Mr. Livesey's arrangements, as to which he appeared somewhat sanguine, was an ingenious construction of a generator within an ordinary setting, instead of separate and apart from the retort-stack, as usual. Saving of room in the retort-house, and utilization directly of the radiant heat of combustion, were the chief advantages claimed for this innovation, which, moreover, promises, with some modifications, to be peculiarly suitable for retort-houses which have no stage, and where the separate generator with its serving tunnel would be deemed unsuitable. Yet it must not be overlooked that space in the coke-hole is only obtained at the cost of space in the retort-setting—room that would otherwise be filled by a retort having to be occupied by a furnace; and as to radiation, there is not much from a separate generator when properly built and jacketed with a non-conducting layer, as used by Dr. Schilling. So that the question of putting the generator within or without the setting would appear to resolve itself into a matter of comparative value of space, granting, however, that this is sometimes of paramount importance.

It was of very great advantage to those present at the meeting, in order to a full comprehension of the whole question, that they were able to hear Dr. C. W. Siemens himself describe the course of his early researches into this system of heating, with which his name is so indissolubly connected. It may be quite true that the forms of apparatus which represent to us the latest developments of the practice of heating retorts, are merely reproductions of designs tried long since by Dr. Siemens, and rejected by him as imperfect; but while acknowledging this, and confessing that more perfect arrangements for regenerative heating on a large scale have long existed, it is still open for us to say that simple appliances of the kind we have mentioned are perhaps better suited to the comparatively small requirements of gas-works, and that, without robbing Dr. Siemens of any portion of the honour which is so conspicuously his due, great credit must be given to those who seek merely to embody the principles which he discovered, in simple forms intended for a special and restricted application.

Mr. Barker's paper on Gasholders was in many respects a model for communications of this nature. Clearly written, forcibly yet temperately argued, and well illustrated, it could not but claim a considerate hearing from any one who might fail to agree with the conclusions to which it arrived. The construction of gasholders, of the dimensions now becoming so common, is replete with problems concerning strength and stability which tax the highest constructive ability in their solution, and no time could be more appropriate than the present for raising the question whether it is convenient, or even safe, to go on increasing the size of these already huge structures, without searching inquiry into the conditions necessary to be observed for their safety, in order that it may be ascertained whether the method of construction which has been successful hitherto with holders of moderate capacity, will be also sufficiently trustworthy if almost indefinitely extended. This is an inquiry which Mr. Barker answered in the negative, at least to the extent of affirming that a totally different design is preferable, in which contention he was not followed by a single supporter when his remarks were subsequently discussed; and we are compelled to say that further reflection has not convinced us of the soundness of his proposals. Mr. Barker confined his remarks entirely to large holders, in which we shall follow him, for one reason that there is nothing novel in the application of a central guiding pillar for small holders; while in the case of larger holders enclosed in houses, in which the central pillar has been adopted, there are really no questions of stability involved.

It is only when we have to consider the case of a large holder of considerable height, freely exposed to stress of weather on all sides, that the conditions under which stability is to be ensured become of paramount importance. Let us take, for example, the case of a gasholder 200 feet in diameter and 100 feet high, in two lifts. The first condition necessary for its efficient working—that of the level of the holder, with particular reference to the hydraulic cup—would appear very difficult of fulfilment when the adjusting base is so small as that afforded by a central column. If a holder could always be adjusted exactly as it rests on its ground supports, this objection would have less weight; but experience proves the contrary. And with a number of roller-paths around the holder in the usual way, the absolute perpendicular of the guides and the simultaneous bearing of all the rollers is of infinitely less importance than when a fourth or a fifth of their number are alone to be trusted in a close group. The force which might at any time have to be transmitted through a very few rollers on Mr. Barker's plan, would in such a case be enormous, and the failure of one of them would probably be attended with terrible consequences. Consider also the tremendous crushing effect which would be produced on the casing of the column at its lower portion when a heavy gale was rocking the holder. Would not the iron plates loosen and fail long before the force which would overturn the column could be reached? Setting aside the question of providing a proper foundation for the column—although, except in rare cases, it would be no easy matter to pile thousands of tons of ballast in a cylinder of moderate area, and keep it free from all risk of settlement—and ignoring also the difficulty of painting and keeping the inner sides of the annular holder in proper order, which Mr. G. Anderson urged with reason, the great and it may be said insuperable objections to trusting the transmission of tremendous forces through a very few points, to a single cantilever, still remain, after due consideration has been accorded to everything which Mr. Barker was able to bring forward in support of his theory.

There is not much to be said for Mr. Barker's proposal respecting the connecting girders between gasholder guide-columns being laid on horizontally instead of vertically, as is the general practice. If these girders are to be considered as struts, they are certainly best fixed in that position in which they will be most rigid; and if they are ties, then again they should not be made liable to sag. But these portions of a gasholder framing are really struts, and should only be designed to keep the upright guides in place. The ties should most decidedly be diagonal. This will be seen at once by supposing the case of a holder framing consisting of columns tied together with girders only at the top. In the event of pressure being exerted on any one column, it can only be relieved by a strain being put upon the rest, just at the point where they are all weakest—viz., at the farthest distance from their bases; whereas if the same thing were to happen to a ring of columns tied down by diagonal rods, the strain would be relieved by them at once in the best possible way. Hence the soundness of Mr. G. Livesey's principle of bracing the new holder which he is constructing at the South Metropolitan works in the Old Kent Road. Whether Mr. Livesey is quite warranted in calling his system of framing an exterior column, is not altogether clear; but there can be no doubt that he is justified in discarding the false column which ought to be a cantilever, and the false girder-tie which should be a strut, and in elevating the diagonal bracing into its proper place.

One word as to wind pressure. Mr. Livesey is probably right in his statement that half the holders in the kingdom ought to have been blown down, if the wind sometimes blows with anything like a pressure of 50 lbs. per square foot. But it is quite possible that from the generally low position of holders, also frequently sheltered by buildings, a holder of narrow margin of stability may never have been subjected to such fearful blasts of wind, which moreover are generally very circumscribed in their field of greatest effort. There is doubtless much truth in Mr. Livesey's opinion that the *vis inertiæ* of a gasholder has something to do with its practical immunity from instant destruction by a hurricane; but it must be remembered that a holder always bears pretty firmly against about half of its guides, and it is conceivable that if the thrice-repeated gusts, of which sailors speak, were to fall in with a holder's period of oscillation, the result might be easily foreseen; and although this has perhaps never yet happened, there is no certainty that it never will.

The Municipality of Brussels, who have the control of the gas supply of the city, recently received an offer from a large

financial Company for a concession of the gas undertaking. It appears that the outlay on the works up to the end of 1879 had been about 12,200,000 frs. (£492,000), and it was proposed to give the Municipality 15,000,000 frs. (£600,000) for the entire concern, being a premium of rather over £100,000 on the sum actually expended on the works, which were to revert to the city at the end of the concession. The public thoroughfares were to be lighted gratuitously on the most improved systems, on the single condition that such systems had been tried for three consecutive years in some place of equal importance and similar general arrangement to Brussels. For a period of six years the Municipality were to receive annually a sum of 600,000 frs. (£24,000), which added to the interest on the 15,000,000 frs. paid for the concession would make a sum equivalent to the profit on the last year's working. At the expiration of the six years the Municipality were to share the profits. Finally, it was proposed that the consumers should pay for their gas at the rate of 18 instead of 20 centimes per cubic mètre, which would be equal to a reduction from 4s. 8d. to 4s. 2d. per 1000 cubic feet. The whole question came before the Brussels Communal Council on the 25th ult., when, after some discussion, it was decided by 21 votes to 4 that there were no grounds to justify the Council in pursuing the negotiations for the transfer of their gas undertaking.

The report of the Metropolitan Board of Works for 1879, recently issued, is wonderfully reticent concerning the proceedings of the Board respecting the installation and maintenance of the electric light upon the Victoria Embankment and Waterloo Bridge. The number of Jablochkoff lamps in use is stated, and the arrangements by which they are worked are detailed, but no hint of any kind is to be found of what the Board think of it all, or what their future proceedings in the matter are likely to be. It is stated that the experiments—which, by the way, are rather extended, in point of time, for "experiments"—have been undertaken by the Board with Metropolitan funds for the general Metropolitan advantage; but have the Board quite satisfied themselves that this extra illumination of the localities named is in all respects desirable? and if so, is the system which they have patronized the best that can be obtained? We are not aware that the Board have attempted to try the expediency of any of the improved systems of gas lighting in the thoroughfares over which they hold the necessary control. While not grudging the Jablochkoff lamps their makeshift position on the Victoria Embankment—for variety is pleasing, and the twinkling carbons give, within brief intervals, every degree of illumination, from noonday blaze to soft twilight mystery—it would only be fair for the Board to try the new gas-lamps for a season; that is, if their steadiness and warmth of colour do not prove to be insuperable obstacles to their adoption.

Considerable importance was recently given by some English and French papers to the fact that the Paris *Salon* was to be lighted by electricity, and the asserted superiority of this light over gas for the illumination of paintings was accepted unquestioned by those who were too indifferent or too prejudiced to inquire very closely into the matter. We find, however, that a class of persons who must be admitted to have some slight knowledge of what is a good and what a bad light for a picture—the artists themselves—have protested against the use of the electric light at the *Salon*, this being stated to be the most unfavourable kind of illumination for effectively showing off their productions. The protest, however, comes rather too late. The agreement entered into with the Jablochkoff Company for the supply of the electric light has been carried out, and this system will, we suppose, remain in use until the end of the season, artistic protests notwithstanding. Again, when sober-minded, right-thinking people ventured to express a doubt as to the permanent adoption of the electric light by those shopkeepers in Paris who had been so ready to take it up as a novel and attractive, not to say startling kind of advertisement, their remarks were received by the worshippers of the rising luminary with all the impertinent contempt usually manifested towards opponents by converts to a new faith. Yet what do we find? The *Figaro*, whose office in the Rue Druot, was one of the first buildings to be illuminated exteriorly by means of the electric light, has positively abandoned that system, and substituted for it two gas-lamps similar to those used by the Paris Gas Company in the Rue du Quatre Septembre, where, by the way, only half the original number of burners are now lighted, and yet the general illumination of the thoroughfare is, we learn, if anything, a trifle better than that of the neighbouring Avenue de l'Opéra, where the electric light still reigns supreme!

Water and Sanitary Notes.

The end of Sir William Harcourt's inquiry into the London Water Supply is at present lost in the "dim distance." The Select Committee sat on Tuesday last, and again on Friday, resuming to-day. Mr. E. J. Smith has been under examination by the Chairman of the Committee during the two days which have thus transpired, and how much longer he is likely to remain so is not quite evident. Immediately after Mr. Smith we may look for Mr. Allen Stoneham, the Government Auditor, and Lieut.-Col. Bolton, the Water Examiner. Sir W. Harcourt's examination of Mr. Smith will, of course, be followed by interrogatories from various members of the Committee, and from the imposing array of learned Counsel. It is a noticeable feature in the arrangements, that while all the other Companies are associated together, so as to be represented by one set of Counsel, the Kent Company has Counsel of its own. This may perhaps arise from the fact that this Company differs from the rest in having a supply to which Dr. Frankland awards his approval. In the examination to which Mr. Smith was subjected by Sir W. Harcourt, there was a manifest difference between the Chairman and the witness in the mode of estimating the value of the water undertakings. In dealing with the prospective value, the difference is very marked. The Chairman offers a calculation based on an average of the last few years, while Mr. Smith looks chiefly to the future, and estimates what the increase in the income is likely to be, without tying himself absolutely to a past average. Throughout the entire estimate, embracing the present and prospective values of the several undertakings, it is palpable that Mr. Smith includes a variety of considerations which Sir William Harcourt is disposed to lay aside, though possibly the right honourable gentleman may change some of his views on this point before the inquiry terminates. Mr. Smith avowed, as the basis of his recent negotiations, a conviction of the impracticability of competition with the London Water Companies. Competition, according to his view, was not absolutely impossible, but he looked upon it as a "practical impossibility." Concerning the efficiency of the present supply, Mr. Smith considered it to be so large that if the constant service were made general there would be no need to increase the total quantity for the next ten or fifteen years.

The manner in which this important subject is being dealt with is somewhat singular. It is as though a defendant in an action were exalted to a place on the Bench, and left his interests solely in the hands of his witnesses, without any Counsel to conduct his case. The conditional agreements made between Sir Richard Cross and the Water Companies are the subject of investigation, but there is nobody to see that the case is fully presented to the Committee. If the Water Companies would undertake to advocate these agreements, the fight would be maintained on terms of equality; but the Companies are merely watching the progress of affairs, so as to protect themselves against harm, without seeking to obtain the acceptance of the agreements. There is, indeed, a mysterious visitor in the person of Sir Theodore Martin, K.C.B., whose presence is due to a request from the Home Secretary. Perhaps this distinguished gentleman will act as "next friend" to the purchase scheme, and at all events will be in a position to write a history of the affair. If power is wanting on one side, there is plenty of it on the other, and we may expect that both the Corporation and the Metropolitan Board will fight against the terms of purchase. Mr. Smith, who is rather to be pitied under the circumstances, informed the Committee that he appeared before them *en amateur*, wholly at his own cost, so far as he could see at present, and that he had not the advantage of the assistance generally rendered in such cases. He appeared in obedience to an order of the House of Commons, and he was "only too happy" to give such information as he possessed on the subject under investigation, in obedience to that order. Mr. Smith also intimated that he was in some little difficulty as to the detailed reports of Lieut.-Col. Bolton with respect to the state of the Companies works. He had received three of the reports, but there had arisen a question as to who was to pay for these productions, in consequence of which the other five reports had never reached his hands, and he had been compelled to rely on the verbal statements of Lieut.-Col. Bolton. "Do I rightly understand "you," inquired Sir W. Harcourt, "that in transactions of "such magnitude as this, the capital question of the con- "dition of the works and the plant was dealt with only "by oral communication?" The witness could only plead that he found the oral reports very useful. It must be

owned that the provisional agreements are left in a very forlorn condition, and it seems as if Lieut.-Col. Bolton himself had fallen into a dilemma. The sudden change of Government has caused a general bewilderment. Possibly Sir W. Harcourt was somewhat amused at the *naïveté* with which Mr. Smith described his admonition to the Water Companies, that they might get something from the Conservatives, but could not count on getting anything from "the other party." "Of course," added he, "I used the "argument exactly as any other purchaser uses an argument, "for the purpose of depreciating the value of the article he is "purchasing." "How far the argument is good, or how far "the argument is bad," continued the witness, "is a distinct "thing; but it undoubtedly, so far as I used it, aided me in "getting each of these eight Companies to agree." The Chairman proceeded to speak of "complicated considerations" —a phrase which came in very appropriately.

A letter which appeared in the City Article of *The Times* yesterday criticized the evidence of Mr. Smith as affording proof that too high a price had been proposed for the purchase of the Water Companies undertakings. The writer has an idea, founded on what he states to be "a general feeling," that in the case of some of the Companies the terms of the provisional agreements will be recommended by the Committee for acceptance, while in the case of others the Companies will have the choice of consenting to a reduction in the terms, or of submission to arbitration of that part of their claim which refers to prospective profits. But it is acknowledged that the Committee will have a difficulty to contend with in taking upon themselves the responsibility of advising a submission of any of the Companies claims to arbitration, in the face of the specific statement made by Mr. Smith that in all cases the amount of purchase-money which he has provisionally agreed to give is below that which would be obtained if the value of the property were determined by arbitration. The *Standard*, in a short leading article on Saturday, also referred to the evidence of Mr. Smith as proving that "the public were fully justified in denouncing as "extravagant the terms proposed in the Government Bill "for the purchase of the interests of the Water Companies." The *Standard* article remarks that Mr. Smith "seems to "have gone to work upon a somewhat singular principle." That is to say, "instead of taking the past earnings of the "Companies as the basis of his estimates, he appears to have "based them on their future prospects and their unexhausted "privileges." Mr. Smith, no doubt, has looked ahead, and if the prospects of the Companies had been bad instead of good, his mode of proceeding would have been approved by the critics who now object to it. Of course, the number of years purchase which the Government scheme proposed to give to the Water Companies depends very much on the basis adopted. Sir W. Harcourt looks backward as resolutely as Mr. Smith looks forward, and considerable disparity is the result.

Mr. Jones, of the Strand district, artlessly inquired at the meeting of the Metropolitan Board last Friday, what were the instructions given to the Counsel representing the Board before the Committee of the House of Commons, with reference to the London Water Supply. This gentleman appears to be afraid that the Parliamentary Committee of the Board will enthusiastically rush into an "undue waste of "the ratepayers money in the purchaseof the water supply." Like other orators elsewhere, Mr. Jones was ruled to be out of order, and thereupon gave notice of a motion for the next meeting. Possibly Mr. Jones has never had the misfortune to employ Counsel on his own behalf, and is therefore unconscious of the imprudence of proclaiming his instructions to them from the housetop. On the other hand, is Mr. Jones really afraid that there is a strong party at the Metropolitan Board determined to have the water supply at any price? Is there likely to be "competition" for the purchase? This is an age of surprises, and we need be astonished at nothing. But Mr. Jones may be altogether wrong, and may be the victim of unnecessary fears.

A parliamentary return obtained at the instance of Sir Charles Dilke has just been printed opportunely for the use of the Select Committee on the London Water Supply. It contains a weighty array of figures, and professes to be the "financial statement on which the calculations are based of "payments to be made to the London Water Companies under "the proposed Metropolis Water-Works Purchase Bill, and "additional revenue required to provide for prospective in- "crease and calculation of income up to 1893 inclusive, &c." Such is the endorsement; but Mr. E. J. Smith, who ought to know something about the "calculations," only acknowledges a sixth part of the return. The rest he "knows nothing "about." Mr. Allen Stoneham, however, is responsible for the remainder, which is doubtless correct so far as it goes, though the title seems rather inexact, considering the circumstances.

Lieut.-Col. Bolton's annual report, to which we made some reference last week, is a seasonable contribution to the water controversy, though we do not understand why a report addressed to the President of the Local Government Board on Jan. 31 last, should fail to make its appearance in print until the month of June, especially when all information of an official character with reference to the water supply is so peculiarly valuable. The report speaks directly and distinctly on the present proposal to transfer the Water Supply of the Metropolis to a public authority, and gives reasons why such an idea should be carried out. Lieut.-Col. Bolton guards himself by saying that, in his remarks on this subject, "it is "assumed that it is the intention to make the best "of the existing sources of supply to the Metropolis, "and to improve them as much as possible, without, at any "rate for the present, contemplating the projects which have "from time to time been submitted for a supply from other "channels." Supposing the transfer to take place, constant supply should be made imperative on the community. The economy to be effected by the unification of the works is shown in some detail, and it is suggested that a practical "standard of quality" should be established. This, indeed, seems to be recommended, even if the supply remains in the hands of the Companies. Lieut.-Col. Bolton, we observe, has been somewhat unfairly attacked by the *Daily Telegraph* in respect to this report, our contemporary scarcely taking sufficient pains to understand the document.

As a set-off to the annual report of Lieut.-Col. Bolton, we have the "Annual Summary" of the Registrar-General, in reference to the vital statistics of London and other large cities during the year 1879. This document contains the usual analyses and report by Dr. Frankland with respect to the London Water Supply, and on this subject the Registrar-General expresses a hope that a satisfactory measure will be passed by the Legislature, which will take that supply "out "of the domain of profitable speculation, and transfer it to "some public authority." Despite the customary criticisms by Dr. Frankland as to the quality of the water supply, the report of the Registrar-General begins by saying, "A con- "siderable improvement has taken place in the health "of London in recent years." The average annual mortality per 1000 inhabitants was 24·1 in the thirty years 1841–70, whereas in the nine years 1871–79 it fell to 22·9, showing a decrease of five per cent. In 1879 the death-rate was 23·3, being nearly the same as that of the previous year. We also read: "A satisfactory sign of the good effects of a "purer water supply is found in the decline of the death-rate "by cholera from 4·67 to 10,000 living in the thirty years "1841–70 to 0·39 in the nine years 1871–79." The deaths from the eight principal diseases of the zymotic class have also fallen from 52 to 39 per 10,000 living, and last year they were down as low as 35. Adopting the views of Dr. Frankland, the Registrar-General urges the general introduction of deep-well water into London, as a substitute for the present river supply. It is argued that a sufficient quantity could be obtained from such a source, "pure spring water being every- "where abundant in the Thames Basin." Scientific opinion, nevertheless, is not all on the side of Dr. Frankland in this matter.

The President of the Local Government Board has been enlightened on the subject of sanitary legislation by a deputation from the Social Science Association, consisting of four well-known gentlemen. The deputation urged the importance of certain amendments which they considered requisite to be made in the sanitary statutes. There were four leading suggestions, one very desirable proposal being that no new building should be occupied as a dwelling-house until an official certificate was given that the premises were properly drained and duly supplied with water. Another proposal had reference to the peril to the public health which arose from the growth of suburban districts outside the boundaries of towns having urban powers.

The Society of Arts has once more held its Annual Conference on the Progress of Public Health, the chair being occupied by the Right Hon. J. Stansfeld. The proceedings occupied two days, and six resolutions were passed. For the present we must postpone our consideration of the details, which comprehend a variety of considerations. A system of local inspection, dealing with the sanitary condition of dwelling-houses, was one of the novelties proposed, such inspection to be followed by the issuing of a certificate, varying in its character according to the state of the dwelling.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE SCIENTIFIC USE OF COAL GAS.

SIR,—Will Mr. Sugg kindly explain more fully what arrangements he would adopt so as to obtain the "non-actinic reading light" alluded to in his lecture at Hull on the 20th of May last, and reported in the JOURNAL of the 25th ult.? I would wish to use an Argand burner.

Liverpool, June 13, 1880. ALEX. M'IVOR.

THE BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—I have observed with much pleasure your able advocacy of changes which, in the opinion of many of its members, are likely to advance the interests and add to the importance of the Association. As a member of some years standing, I have noticed with regret that many excellent suggestions, emanating from succeeding Presidents, or during the course of our discussions, have fallen to the ground, not perhaps from lack of persistency so much as from the want of efficient machinery to bring them to maturity. It may have been a misfortune rather than otherwise to the Association that its rules were some years ago amended in a spirit of such absolute democracy as not to permit of the re-election of any President to a second year of office; but I think you have hit the greater blot in ascribing the paucity of progressive legislation to the entire absence of consultative meetings for nearly ten months in every year.

The suggestion that there should be a class of associates is of no recent origin. It has formed the subject of discussion amongst the members for some time past, and, I believe I am correct in saying, has been debated also at successive Committee meetings. That it would relieve the Committee of a difficulty of not unfrequent occurrence when having to deal with applications for membership from persons who cannot be described as either managers or engineers, but whose future may be said to be dedicated to gas manufacture, there can be little doubt, although it is to be expected that, under any circumstances, occasions will arise to test their ingenuity and judgment. It is doubtful also whether there is not something very inconsistent in the idea of an associate of an association—the latter term signifying equality for all purposes, except that of governance. But underlying all these proposals and discussions there is the undoubted desire for an enlargement of the scope of the Association, and therefore the question which I trust the Committee will seriously take into consideration at an early date is, whether the time has not arrived for a new departure; whether sufficient progress has not been made to justify the commencement of a new era. By the Institution of Gas Engineers, with its members or fellows, associates, graduates or students, and honorary members, the present work of the Association might be carried on, not only without the slightest interruption, but with greatly increased success, since it would be the means of attracting to itself a much more numerous body than is at present possible, while it could not but most materially raise the status of the profession. Into such a corporation all of the present members would have the right to enter, upon the same footing in all respects as that which they now enjoy, although to future candidates for admission fresh regulations would, as a matter of course, have to be applied.

Although, with regard to the other valuable suggestions that have been made, much could be done by the Association as at present constituted; yet, rightly or wrongly, I look upon such a reconstruction as that which I have ventured to propose for the consideration of my fellow-members as the only one capable of providing really efficient machinery for carrying into effect their known wishes, and for satisfying the natural and growing aspirations of the profession at large.

June 18, 1880. FORWARD.

SIR,—Referring to Mr. Livesey's remarks at the meeting on Wednesday, the 9th inst., in connection with large makes of gas, I know of two gas-works where the quantities of gas made per ton of coal are 11,400 and 11,200 cubic feet respectively, and the quantities sold 10,500 and 10,200 cubic feet. In one case the illuminating power is 18 candles, and in the other 16 candles. The quantity of cannel used in one case is 3 per cent., and in the other about 12 per cent. In neither case are the retorts burnt out in the time specified by Mr. Livesey.

June 16, 1880. A PROVINCIAL GAS MANAGER.

Legal Intelligence.

HIGH COURT OF JUSTICE—COMMON PLEAS DIVISION.

THURSDAY, JUNE 10.

(Before Lord Chief Justice COLERIDGE *and a Special Jury.)*

JOHNSON AND OTHERS *v.* THE GASLIGHT AND COKE COMPANY.

HANNAH JOHNSON *v.* THE GASLIGHT AND COKE COMPANY.

Mr. WILLOUGHBY, Mr. SIMS, and Mr. WHITAKER appeared for the plaintiffs; and the ATTORNEY-GENERAL, Mr. MORGAN HOWARD, Q.C., and Mr. TYRRELL PAINE for the defendants.

Mr. WILLOUGHBY said the action was brought to recover compensation for the plaintiffs and their children, who had been injuriously affected by a large escape of gas from a main-pipe belonging to the defendants into the house No. 50, Ellesmere Road, Old Ford, on the morning of Dec. 17, 1878. The plaintiff was a fish salesman in Billingsgate Market, and in consequence of the injuries he sustained he was prevented from attending to his business for three months; there were also expenses incurred in removing from the premises and for medical attendance to himself and family, and also the injury to his business which he suffered in consequence. The main-pipe in question was laid down in the year 1864, and it had been ascertained that in 1869 an explosion had taken place in the same road as the present, in consequence of which the pipes were examined and repaired. It was, doubtless, not only the duty of the Company to lay down their pipes in any road in which they had power to do so, but also to take reasonable and proper care of those pipes during the time they were in the road, so that the inhabitants might not be injuriously affected by anything that might proceed from those pipes; and the Company certainly had the opportunity of doing so in the years 1869 and 1870, when, in consequence of some defect, it was necessary to make an examination, and it was discovered that the pipe had sunk in the roadway. It also appeared that in 1873 the then tenant of the house had a service laid on from the main, and the Company had again the opportunity of seeing the state and condition of the pipe. In 1874 the use of gas was discontinued, and the service-pipe was thereupon disconnected. The main-pipe was at that time plugged, and the service-pipe capped, so that no gas should enter the house, and subsequently the whole service-pipe was disconnected. Nothing more was heard of the matter until the 17th of December, 1878, when, undoubtedly, a large escape of gas went into the plaintiff's premises, and the supposition was that it percolated, not through the service-pipe itself, but went round it, and so into the house. Of course, immediately after that matter took place, it was looked into by the officers of the Company, and the pipe was found to be fractured, and something was done in the way of repairing it; but it was not until 1879 that the whole main was looked at, and then the cause of the fracture was made apparent—viz., the improper soil which had been used to support the pipe. Instead of using proper gravel for the purpose, shifting sand of a treacherous description had been employed, and the pipe had therefore broken down. A new pipe was subsequently inserted in place of the piece which was fractured, and, in addition, a quantity of gravel and ballast was used to reinstate the road. There ought not, however, to have been the treacherous shifting soil on which the pipe was laid, but a proper substratum; and if that had been done, probably no explosion would have occurred. The contention of the defendants was that some time or other some one had made a drain from the house to the sewer, which went down the centre of the road, and that in doing so the earth had been disturbed and replaced so improperly that the result was prejudicial to the gas-pipes, and hence it was no fault of theirs. He (Mr. Willoughby), however, submitted that this would not exonerate the Gas Company, although it might give them a cause of action against the parties who made the drain. In the first place, the drain from No. 50, Ellesmere Road to the main sewer lay in a different direction from where the soil under the pipe was; one was longitudinal, and the other was transverse. Again, the drain was made about the year 1866, and if there had been any subsidence of the soil, the Company having opened the ground in 1869, in 1873, and in 1874, had had ample opportunity of seeing the state and condition of the soil; and it was their bounden duty not only to look after the state of their pipes, but also to look after the soil which was under those pipes, and when the previous explosion took place they ought to have put in fresh earth so as to prevent the same thing happening again. One of the principal things a gas company should see to was that the soil which supported their pipes was in a proper state, but if they used a quantity of sand and rubbish, that was not a proper support, and what had happened on the present occasion was what might have been expected. Evidence would be produced to show that the pipe was not at all in a good condition, and that it ought to have been removed long ago, and therefore the Company had been guilty of negligence in this respect.

The following evidence was then called:—

Mr. *James Johnson*, the plaintiff, examined by Mr. SIMS, said that he went to bed on the night of Dec. 16, 1878, in his usual health, and the next thing he remembered was one of the Company's servants leading him up out of the street.

Lord COLERIDGE said he took it for granted that there was no doubt about the gas escaping into the house.

Mr. PAINE said it was not denied that the plaintiff was more or less affected. It was, therefore, a question of liability, and also of damages.

Witness (continuing) said he was ill for some time afterwards. After the explosion he went to his father's, and believed he stayed there, but could not remember. He left the house under medical advice, and during the time he was away he was attended by the doctor. It was five weeks before he was able to go to the market, but he was not fit to do anything for three months. At the time of the accident he estimated his profits at £10 per week, but during the time he was absent he lost one-half or one-third of his business, and he had not recovered his customers since. He was still under the doctor, and the shock to his system made all his nerves shake. He should think he had lost £400 or £500 altogether. Some of his furniture was moved into his father's house, but not all. The windows and doors were out, and everything was exposed to the air.

Lord COLERIDGE said he presumed £500 would put the plaintiff into cash again.

Witness said it would, including what he had paid to the doctor for attending to himself and family.

In cross-examination by the ATTORNEY-GENERAL, witness said he did not keep any books, his being a ready-money business. He had no banking account, and did not pay any income-tax. Could not say for how long he had been making £10 a week, and had no vouchers to support his statement. When he went back to business he could only do one day's work in one week, and perhaps two days another week, for three months. The doctor's expenses were £25; but they were not yet paid. He had been nursed by his mother while he was ill, and £40 was charged for that and medical attendance. [Witness was cross-examined at some length in reference to the monetary part of his claim, during which he stated that sometimes he made £20 a week and sometimes not £5.] He had not much recollection of the accident, because the gas rendered him insensible. Had been in the habit of consulting the doctor once or twice a week ever since the explosion. Had an interview with his solicitor on the 19th of December—two days after the accident—and instructed him to issue a writ against the Company. Did not know at that time how the accident occurred, but thought he deserved compensation.

Mrs. *Hannah Johnson*, examined by Mr. WILLOUGHBY, said she was the plaintiff in the second action, and was a widow, Mr. James Johnson being her brother-in-law. On the morning of the 17th of December she was awoke by hearing groans proceeding from the bottom of the house, and on going down she found her sister-in-law had crawled to the door partly unconscious. As she turned round to go downstairs she was "knocked aback" by the smell of gas, and immediately rushed to the street and yard door, and opened them to let a draught through the house. Mr. Johnson was found at the bottom of the stairs insensible, and a neighbour assisted in getting him into the passage. An officer from the Gas Company, who called to find out where the escape came from, advised them to get out of the house by all means, which was done. She did not complain of her state of health, except that she had a very bad cold from having to go out so much.

Cross-examined by Mr. PAINE: Mr. Bird was the gentleman who ordered them to leave the house, and they went at once. Two other gentlemen—Mr. Newall and Mr. Carter—also called, and said the windows ought not to be shut, and they were opened accordingly.

Re-examined by Mr. WILLOUGHBY: Witness was suing the Company not only on her own behalf, but on that of her eldest daughter, who had been injured in her health for some little time. She had also suffered herself through loss of business—tassel-making—caused by finding her brother-in-law very near death.

By Lord COLERIDGE: Her daughter Alice had also been very ill through the effects of the gas, but she was getting better.

Miss *H. Johnson*, examined by Mr. WILLOUGHBY, said she was daughter

of the last witness, and was in the house at the time the gas escaped into it. Felt a pain in her head and chest, but went to business and had to return home again, where she remained three days. Suffered from chest-ache for two or three weeks after, and had a nasty taste in the mouth, which lasted for a long time; it was like the taste of bad onions.

Cross-examined by Mr. PAINE: Was quite well at present.

Mrs. *S. Johnson*, examined by Mr. WHITAKER, said she was the wife of the plaintiff in the first action. Remembered the morning of the 17th of December, because she thought her husband was dying. Was very bad herself, but was able to call her sister-in-law. Was attended by Dr. Taynton, and suffered in the chest and head, and also from bad appetite, which lasted over a week.

Cross-examined by Mr. PAINE: Was now quite well herself, but her husband had not been well since. Remembered two gentlemen calling, but they did not complain to her of the windows not being open; that was to her sister-in-law.

Dr. *W. Taynton*, examined by Mr. WILLOUGHBY, said he was called on the morning of Dec. 17, 1878, to see Mr. Johnson. Found him sitting on a chair near an open window on the first floor in an insensible condition, caused from the inhalation of gas. Also saw Mrs. Johnson, but she was not so bad; she was dizzy, but could speak. Had attended Mr. Johnson ever since; he had been suffering from a very weak heart, and his breathing was still very bad. He was confined to his house for five weeks, and it was three months before he was able to attend properly to business. Up to the present time he was suffering from extreme nervousness, and had become much thinner since the accident. The wife was also under the care of witness for about a month, and likewise the children, but they had not suffered to the same extent. Had also attended Mrs. Hannah Johnson and her family, who were suffering from the same cause.

Cross-examined by the ATTORNEY-GENERAL: Had not seen a case of gas poisoning before or since. Had never examined plaintiff before the accident, but said that he had now a weak heart, which he thought might have been produced by inhaling gas, although he did not say it was so. Should certainly treat gas as a volatile body. Whether the effect would pass off quickly would depend upon how long a patient had been exposed to it. Was not aware plaintiff was out on the 18th or 19th of December, and did not think he was able to walk out. Could not say why he paid the lawyer the compliment of a visit, but he did not call on the doctor. Did not keep account or record of the case, because he was under the impression it would be settled. Had not made any entry of his charges, which were 3s. 6d. a visit, and had made about 70 visits altogether during the three months. Had not been paid one farthing up to the present time. The total of the bill for visiting the whole family for the three months was £25, but could not say what was the amount up to the present time. [A lengthy cross-examination took place as to a discrepancy in the figures between the account as originally rendered and a copy which was produced in evidence, but no point of interest was involved.]

Dr. *W. Abbott*, examined by Mr. WILLOUGHBY, said he was a member of the London College of Physicians. At Christmas, 1878, was called in to have a consultation with Dr. Taynton with reference to the plaintiff and members of his family. Had studied the effects of gas poisoning. The immediate symptoms in the present case were detailed by the plaintiff, and they were such as would arise from inhaling coal gas. Plaintiff complained of severe headache, frequent nausea, a peculiar taste in his mouth, which he compared to that of onions; also languor and drowsiness, and an inability to sustain any continued exertion. Had noticed the personal appearance of the plaintiff, who presented a drowsy look. His face was pale and sallow; he flushed from the least exertion; his muscles were weak and flabby, and he showed a general evidence of want of tone in the system, the heart's action was feeble, with occasional palpitation, and the respiration was frequent and rather laboured. The feebleness of the heart might have been a previous thing. Had seen the plaintiff eight or ten times since the accident. Saw him in March last year, in company with the Medical Officer of the Company, Dr. Hastings, when he was considerably improved, but was not in a healthy condition. There was not much the matter with him at the present time. The remainder of the family had suffered in the same way, but not to so great an extent. The longer a person breathed a poisonous atmosphere the more seriously he was likely to be affected by it; the lungs would be more charged with the gas, and of course there would be a greater difficulty in carrying it off.

Lord COLERIDGE: I do not follow that quite. I thought the lungs would deal, for good or for evil, with what was in them.

Witness: So they will to a certain extent; but it would be absorbed into the system.

Lord COLERIDGE: What is in the lungs is either burnt up at once or is discharged?

Witness: It becomes absorbed in the coats of the blood-vessels, and the linings of the membranes of the lungs.

In answer to a final question by Mr. WILLOUGHBY, witness said the total amount of his claim would be 15 guineas.

Cross-examined by Mr. PAINE, witness said that the immediate effects of gas poisoning would pass off in 24 to 36 hours, but then there were the secondary consequences. He had never analyzed the Company's gas, but there would be a great deal of sulphuretted hydrogen in it. If the poisoning were purely by carbonic oxide, the patient would recover very shortly as a rule, but the effects of sulphuretted hydrogen would not be so soon thrown off.

At this stage the witness protested against the learned Counsel being prompted by Dr. Tidy, the Chemist of the Company.

Lord COLERIDGE said that in cases like the present Counsel must be dependent upon scientific men for their instructions, but he would take care the witness was properly protected.

Cross-examination resumed: Sulphuretted hydrogen could be detected, apart from chemical examination, by taste and smell. Hydrocyanic acid was more volatile than carbonic oxide. It was a fact that when a patient had inhaled coal gas he would recover quickly if he had not inhaled it for any length of time. Even if a person had a powerful heart, the result of inhaling coal gas would be to weaken its action, although not, perhaps, for a long time. He believed the plaintiffs were breathing the coal gas for 12 hours.

Lord COLERIDGE: Did you ever see or hear, or read of, or dream of a case of heart disease produced by inhaling coal gas for a few hours?

Witness: No, my lord.

Henry Lacey, a licensed porter, examined by Mr. SIMS, said he was passing the house on the morning in question, when Mrs. Johnson opened the street door and he saw Mr. Johnson in an insensible condition. At that time there was a strong smell of gas in the house. He then went to Dr. Taynton, and afterwards called at the Gas Company's office and gave information. He subsequently saw the Company's men repairing the pipe in the road by putting on clamps.

Mr. *Matthew Jones*, examined by Mr. SIMS, said he passed along the Ellesmere Road four or five times a day. About a week before the explosion there was a very strong smell of gas in the road, and he had called at the Gas Company's office and mentioned the circumstance.

In cross-examination by Mr. PAINE, witness said he gave information at the office in King Edward Road, and pointed out a gentleman in court as the person he had spoken to. The gentleman alluded to, however, denied the statement.

Mr. *Henry Jackson*, examined by Mr. WILLOUGHBY.

I am a Civil Engineer, and an Architect and Surveyor, residing at Holbeach, in Lincolnshire. I was in the Ellesmere Road with the Company's servants on the morning of the explosion. I went into the house and examined more particularly betwixt the basement and the ground-floor; it was at the time very fully charged with the gas.

Mr. PAINE said he would admit that the gas came up from the basement of the house.

Examination resumed: I saw the men opening the ground, but could not see much of the main, because the hole was so small. Later, on Feb. 15, 1879, I saw the whole length of the main, which was made of English cast iron in lengths of about 9 feet. I inspected the main with Mr. Emmett and another gentleman. We found that it had been broken in two places, and repaired by what are termed slip-joints; but the main appeared to me to be already too much deteriorated from the effects of the ammonia and the sulphur. The ground all along each side was very strong with ammonia, and we took samples of it. The soil on which the pipes were laid was very rotten; the sand had been excavated, and no doubt sold for its value, and the cutting had been filled up with *débris* from anywhere, and that would naturally settle down, if it was not properly consolidated by punning with water or ramming. The main was laid about 2 feet 6 inches from the surface of the road; I did not observe any water-pipes there. There is a main sewer going down the road at a depth of about 10 or 11 feet. [Witness produced various plans showing the position of the pipes and how they were connected with the main, and was examined with reference to the same.]

Lord COLERIDGE said that as he understood the case the substance of the difference was that the drain was driven under the main at a time when the defendants did not know of it, and by persons for whom they were not responsible; and that in consequence of the supports being interfered with, the main cracked and the gas came out.

Mr. PAINE added that the Company did not know that the ground had settled.

Examination resumed: I saw a portion of the old main removed, and a 6-feet length inserted, which was a great improvement.

Cross-examined by Mr. PAINE: I have erected gas-works, but the actual laying down of mains has not formed part of my practice; still I can speak with some authority. In my judgment the main in question was so rotten that it was percolated, or pretty well so, from the action of the sulphide of ammonium. The lifetime of a main depends upon the purity of the gas. I cannot say whether the piece of pipe produced was taken from the main which was broken, but should say it was not. Assuming it to be the same, however, it is not in bad condition. I do not know when the main sewer of which I have spoken was laid, nor when the connection was made between the house and the sewer. I do not suggest that the Gas Company placed the rubbish in the road; that would be done by the party who put in the drain. One portion of the pipe which was deflected was close to where I was told there had previously been an explosion, which had driven the pavement up into the street, but I am not personally acquainted with that matter.

By Lord COLERIDGE: I ascertained the condition of the pipes by the appearance of the piece that was taken out when the new piece was inserted. We could see the action of the salts very materially, as it had been worn quite thin; it was also deteriorated very much outside as well, it being rusty and eaten away. I did not take a portion of pipe up and examine it; I simply looked at the section as it lay on the ground. I had examined the whole length prior to that, and, in company with Mr. Emmett, had gone into the trench to examine the slip joints. Of course I could only see the externals of the main as far as it was bared.

FRIDAY, JUNE 11.

Mr. *William Woodward*, examined by Mr. WILLOUGHBY.

On Feb. 25, 1879, I went to the Ellesmere Road with Mr. Jackson and Mr. Emmett, for the purpose of inspecting the mains opposite the plaintiff's house. Immediately in front of the house I noticed that a 9-foot main had been cut, and a portion taken out and a new piece inserted with a slip-joint, but I did not see the piece which had been removed. I went into the trench and walked from end to end of the road, and found the pipes were in a fairly good condition.

Mr. WILLOUGHBY: Did you also notice the road or substratum on which the gas-pipes were laid?

Lord COLERIDGE: There was no cross-examination as to that. It was an admitted fact that the pipes were laid in insufficiently rammed rubbish, and were thereby let down and broken, and an escape of gas caused. One of your witnesses on yesterday said it was not for a moment suggested that the Company did it; but your case, as you opened it, is that, notwithstanding, the Company are liable, and I have been thinking for some time that unless you insist on other things, it is coming much more to a question of law than of fact.

Mr. MORGAN HOWARD said that, as he understood, what his lordship had pointed out was no doubt conceded as to the part where the fracture was, but he did not know that the admissions went farther than that.

Lord COLERIDGE: We are trying who is liable for the undoubted escape of gas at a particular place. At this place it is an admitted fact that the pipe was lying in insufficiently rammed rubbish, and in consequence it bent down and broke, and a quantity of gas escaped. It is a question who is liable.

Mr. WILLOUGHBY said he went farther than that.

Lord COLERIDGE said that as to the rest of the case he should not stop the learned Counsel, but as to this particular part he should do so. The rubbish might be taken as an admitted fact.

Examination resumed: The condition of the road was bad from end to end, and the pipe had sunk in many places. I put a level on it several times, and found it was not level.

Lord COLERIDGE asked Mr. Willoughby what they had to do with anything that did not produce the mischief?

Mr. WILLOUGHBY said it was the duty of the Company to look after their pipes from one end to the other.

Lord COLERIDGE: Granted; but you cannot bring an action against them because they do not perform their duty unless you suffer from such neglect. The question is, what happened at the point where you say they did not do their duty, and you suffered? Whatever you have to say about that is most material; but, supposing it had been a mile away, it would have had nothing to do with the matter.

Mr. WILLOUGHBY said it only went to show that there ought to have been an examination of the pipes.

Lord COLERIDGE: At present I have no evidence as to the pipes. It is not that the pipes were bad, but the bed in which they were laid was bad, and the pipe had sunk in many places. (To witness:) You say that the bed was insufficient?

Witness: Yes, my lord. The earth under the pipe had not been removed; it was simply laid down.

Examination resumed: I made a model plan of the pipes as they would

have been before breakage, and after breakage and repairs. I agree with Mr. Jackson generally in what he has stated.

The witness was not cross-examined.

Lord COLERIDGE said he did not know what to make of the case, because some of the things which Mr. Jackson said were not questioned at all, while as to the particular point on which he was questioned, the last witness could not confirm him because he did not see the pipe. After some further remarks with reference to the rubbish which had been used to fill up the holes from which the sand had been taken, the learned judge reiterated his opinion that the question of liability appeared to be one of law.

Mr. WILLOUGHBY said he did not accede altogether to his lordship's view, but he would like to call the District Surveyor, who really superintended the operations.

Mr. George Emmett, examined by Mr. WILLOUGHBY.

I went with last witness and Mr. Jackson to look at the place where the accident happened. I saw the ground along the trench, and it was very bad earth indeed to lay pipes in. The pipes should be laid in a good bottom, so as to keep them level, and prevent any settlement.

Mr. WILLOUGHBY drew the attention of the Court to the Metropolis Gas Act, 23 & 24 Vict., cap. 125, which stated that when a gas-pipe was in position, there was to be a certain amount of clay used to form the bed.

Examination continued: In old roads the bottom is solid, and they very rarely require anything; but if it be loose underneath it ought to be properly rammed or gravelled.

Mr. MORGAN HOWARD (interrupting), said the section merely used the expression "well and sufficiently bedded," but it did not say what materials were to be used, nor how the work was to be done.

Lord COLERIDGE read the clause, adding that it did not say much about the matter. The old roads when they were solid required no foundation, but they required gravel or some bed to lie in.

Cross-examined: The gravel was all dug out when I went there. I produce some earth taken from where the escape had been, and in my opinion it is very bad stuff. I saw that a new piece of pipe had been put in, but I did not see the piece which had been taken out. With regard to the other portion of the pipes, I could not complain of them, although they were very unlevel from one side of the road to the other.

Cross-examined by Mr. MORGAN HOWARD: I have been concerned in laying both gas and water pipes in Bermondsey, under the different Companies, and in Lambeth as well. I have frequently seen the soil give way in new roads under the pipes. I know nothing of the history of this particular roadway, nor of what was done with reference to the sewer, the house drains, or anything of that sort. I do not know what should be done in this case to remedy the want of support or subsidence of the soil.

A number of interrogatories and the replies thereto by the Company on the subject of the escape of gas and repairs of the pipes were then put in and read, as likewise the reports of the officials engaged in the work.

Mr. *Samuel Snooks*, a master mason, examined by Mr. WILLOUGHBY, said that the paving was laid down in the Ellesmere Road at the latter end of 1866, at which time the drains were all complete.

Mr. *Charles O'Brien*, examined by Mr. WILLOUGHBY, said he was a fish salesman in Billingsgate Market, and had been in the habit of employing the plaintiff upon commission. He did a good business so far as witness knew. After the accident, he did not attend to business for some time, and when he returned he appeared very ill.

Mr. *William Henry Gathercole*, examined by Mr. WILLOUGHBY.

I am Surveyor to the parish, and have to keep the Ellesmere Road in order. I was not in office when the main sewer was laid down. It is customary to give notice to the gas and water companies when any repairs are going to be done to the sewers, in order that whatever is disturbed—whether paving or macadam—may be replaced at the expense of those who make the drain, and that the gas and water companies may see that the replacing of the roads is done in the proper manner. Nothing more than ordinary repairs have been done to the drains in the Ellesmere Road during the three years I have been in office.

Cross-examined by Mr. MORGAN HOWARD: The road has been in a fair state of preservation during the time I have known it.

Mr. WILLOUGHBY said this was the case for the plaintiffs.

Mr. MORGAN HOWARD said he would take his lordship's view as to what course should be pursued. It was now common ground between the parties that the sewer was made in 1866—two years after the pipes were laid by the Gas Company. It was also common ground that in the operations which were carried on with reference to sewerage excavations the ground was made and materials removed. He was in a position to lay before the Court a body of evidence of what the Company had done since 1864, but he thought the question resolved itself into whether they were responsible for the acts of third parties.

Mr. WILLOUGHBY said he did not admit it was the act of a third party. A witness had stated that the sand had been removed, but he could not say by whom.

Lord COLERIDGE said he should be very much surprised if the jury did not see what was perfectly plain—viz., that the natural effect of the evidence was that this was done at the time the sewer was made, and by persons over whom the defendants had no control. He would, however, consult with Justice Grove on the question.

Mr. WILLOUGHBY quoted the case of *Hipkins v. The Birmingham and Staffordshire Gas Company*, in which the Company were sued for damages for polluting water. In that case there had been mining operations underneath a gasholder-tank, which sank in consequence, causing a leakage and fouling the water. The Company set up the defence that it was the act of other persons; but the Court of Exchequer held that the Company had not exonerated themselves from the presumption of negligence, because they had not shown that they might not have constructed their tank in a different position, where the danger from the excavation might not have existed, or that they might not have prevented the injury by the use of other mercantile means.

Lord COLERIDGE: I did not know of that case, but I have been thinking that I should have been disposed to have held, irrespective of it, that the duty of the Company was absolute. (To Mr. Howard:) You may have a remedy against those persons who laid down your pipes, but when your pipe has been laid, the plaintiff has his first remedy against you.

Mr. MORGAN HOWARD said he ventured to think otherwise.

His LORDSHIP then retired to consult with Justice Grove. On his return he said that his learned brother confirmed his view. The defendants were dealing with a matter which might be noxious and cause damage, and it was their duty to take every reasonable care to prevent the escape of it, so as to prevent damage. So far as appeared, there was evidence that the sewer was made, and that the Company had notice of it, and might have seen that the ramming, or whatever it was that did the damage, was properly done. There was no fault of the defendants—nothing done actively that was wrong—but unless they could show that they had no power to interfere, and that they were absolutely in the power of the sewer authorities, there was very cogent evidence to go to the jury that all proper care was not taken.

Mr. MORGAN HOWARD: Then I understand your lordship at present to rule that it is a question of negligence or no negligence.

Lord COLERIDGE: I think so.

Mr. MORGAN HOWARD said, so far as he had read the evidence, there was nothing to show the Company had notice of the operations of the sewer authority.

Lord COLERIDGE said that "notice" did not mean a piece of paper. It meant knowledge, and that was a question of fact to be left to the jury. The operation of the sewer-laying was a long business, and the Company must have known of it.

A conversation ensued in reference to the general condition of the main, which Mr. Jackson had stated to be deteriorated, and which Mr. Willoughby said he should rely on. The learned judge, however, pointed out that the witnesses Woodward and Emmett, who were practical men, had described it as being in good condition.

Mr. WILLOUGHBY then said he relied on five distinct acts of negligence—not having a proper pipe; not laying it properly, and then from time to time looking after it; not having proper inspection of it from time to time; not having it put in order after receiving distinct notice that there was an escape of gas; and breaking up the streets, and so letting the gas into the man's house.

Lord COLERIDGE said the point he should leave to the jury was whether the Company, in 1866, when the sewer was made, or the drains connected with the sewer, under the pipe, did all that was reasonably to be expected from skilful men with a treacherous substance in hand to prevent the escape of it, and to see that the pipes were properly relaid and properly supported. If not, there was evidence of negligence which would make the Company *primâ facie* liable to the plaintiffs; for how much was a very different question.

Mr. MORGAN HOWARD, on behalf of the defendants, said the object in view was to ascertain what was the cause of the explosion, and how it came about in the first instance. The case seemed to have resolved itself into the year 1866, and it was due to the defendants to say that they were keeping nothing back, but really offering evidence, in opposition even to their own interests, to show what was the actual state of things at that or at any other time. Witnesses would be called who would prove that no act had been done, and that no act had omitted to be done, which could have brought these people into the trouble which they met with on Dec. 17, 1878; and that everything was done which could reasonably have been done to make the pipes safe and to prevent any gas escaping, because to call it an explosion was giving it a wrong term. It was an escape of gas which penetrated through soft earth into the house, and led to the unfortunate results they had heard about. It would be shown that in 1866—two years after the pipe had been thoroughly well laid, and in a well-bedded place, with all the precautions that could be taken in the matter—some sewers or drains were constructed, and cross drains laid down by Mr. Hall, who had houses there, and that in consequence of some of the excavations being imperfectly filled up, there probably was a subsidence. That this was the time the mischief was done there could not be a doubt, and this was the defence which would be made. It was a very strange thing to say—as his learned friend almost ventured to do—that a Gas Company which had some 1500 miles of gas-pipes to attend to should keep such a rigid and vigilant guard over those pipes as that no escape of gas should possibly take place, and that there should be no subsidence of the soil on those 1500 miles of piping, but that practically the Company should become insurers of the public safety. If this were the case Parliament would be called upon to interfere, because it would be impossible to prevent the happening of occasional accidents from one cause or another. In the present instance there was no escape into the service-pipe, but the plaintiffs case was that an escape took place, and that the gas permeated round the pipe and through the ground, and so into the house; and this might well be the case when a fracture of a gas-pipe took place, and undoubtedly there was a fracture here, but the cause of the escape of gas was not through the act of the Gas Company. Their main had been thoroughly well tested in 1864. The person who caused the mischief came upon the scene two years later; he laid his drains down for the purposes of sewerage, and probably he unsettled the earth. After a lapse of some years there was a slight sinking of the soil, and then the pipe gave way and the gas escaped; and this was how the Gas Companys were said to be liable. As a matter of fact, the Company were not aware of the mischief which was being done in making the cross drain. There were no complaints of escapes of gas at that time; and, in fact, everything Mr. Hall did was as well done as could be. It would be shown by scientific evidence that there was an unconquerable difficulty in compactly and firmly bedding earth together so as to prevent, under some circumstances, an escape of gas. No doubt his lordship would tell the jury that the Company were only bound to take all reasonable care, and that they could not be expected to go beyond that. They had to lay their pipes in the earth, and then they must trust to the inherent qualities of the soil to protect them. They could not control nature, but they were subject to those slight accidents which might take place where they were dealing with a volatile substance like gas. In October, 1869, and February, 1870, there had been repairs for slight escapes opposite Nos. 60 and 72 in the same street. Those defects were immediately and effectively put right, because not until the accident took place in 1878—some years afterwards—was there the slightest pretence for saying the gas was escaping or that there was anything wrong. One witness had been called who stated that only a week before the explosion he had called at the gas office, and had given notice to Mr. Carter of an escape of gas at this spot but Mr. Carter would tell the jury this was not true. He should also show that the main had been properly plugged. His learned friend had thrown some doubt upon the matter, but it would be proved that there was no foundation for the suggestion. With regard to the piece of pipe which had been produced, when the witness was asked to look at it and say if it was not in good condition, he did not venture to say it was not, but sheltered himself under the statement that it was not the piece which had been taken away from the place; but it would be shown conclusively that it was the same. It had been taken by the representatives of the Gas Company, and kept ever since, and was produced at the present time to show the real state of the facts. If this was the pipe, it was still more clear than it was before that there was no inherent bad quality in it; and the only objection to the piece of pipe was from the result produced from an act outside the Gas Company, and for which it was hoped the jury would say they were not responsible. With regard to the plaintiff himself, he (Mr. Morgan Howard) submitted that the statements put forward were extravagant, both as to the illness and the consequences which were supposed to have arisen from it. The jury had heard the evidence, and it would be for them to say how much they gave credence to. If the plaintiff was a ruined man, he was very quickly ruined by a very simple cause. He was ruined on Dec. 17, 1878, but not sufficiently ruined in health to prevent him from going two days afterwards to his solicitors, and instructing them to bring an action, without taking any of those preliminary steps which were fair and reasonable—especially with a Company like the defendants—for the purpose of seeing whether there was a just cause of complaint, and a reasonable way of meeting

him on their part. Not only that, but on the day itself on which the accident occurred, he appeared to have gone out for a walk, and yet they were now asked to draw the inference that the effect of the gas had produced a weak heart. If a man had a weak heart naturally, it might be that a considerable dose of gas would functionally derange his heart, as it might his stomach or any other organ, but to suggest that it would produce a weak heart was extravagant and beyond all reasonable bounds. On this point medical gentlemen would be called who would state that a large quantity of gas would be either fatal by reason of abundance of bad qualities, or would pass off without much inconvenience. He, therefore, hoped the jury would be of opinion that there had been a zeal shown on the part of the plaintiff, and those who were associated with him in the case, to magnify the consequences of the inhalation of gas, and to present a largely exaggerated notion of what befell the plaintiff, and of what happened to him in consequence.

Mr. *Thomas Hersey*, examined by Mr. PAINE.

I am a Civil Engineer, and was in the service of the Imperial Gas Company from 1845 to 1876. The pipe in Ellesmere Road was laid under my direction. It was tested before leaving the Company's works with 300 feet head of water. On Feb. 25, 1879, I visited the Ellesmere Road, when the pipe was laid bare the whole length. My attention was drawn to the place where the pipe had been repaired. I saw the old piece of pipe afterwards. At my suggestion a shaft was sunk from the drain of the house to ascertain the condition of the soil, and it was found that the pipe had been broken immediately over where the house drain had been made. I found that just under the drain, and directly under where the fracture had taken place, a man could force a crowbar down 4 or 5 feet in the footway. The road would have been very solid in that part if it had not been for the drain, which led me to believe that the settlement in the drain had caused the fracture of the pipe. Supposing attention had been called to this particular drain in 1866, and all possible power had been put on to ram the earth, I have no doubt it might have been made a little better, but I do not think it is quite practicable for a Company to do such things as that. I never had notice of a house drain being made in all my experience. A spirit-level was applied at several points in the road, and the pipes were tested. They had the proper inclination; they should not be level, but should incline slightly, and they did so. All the joints were right but one, which was at some considerable distance from the plaintiff's house, where a water-pipe was under repair. The state of the bed in which the pipe lay must have been fairly good, or the pipe would not have retained its inclination so well as it apparently did. The broken piece of pipe was submitted to me at the Company's office, and I identify the piece now shown as being the same. It is about 12½ per cent. heavier than ordinary gas-pipe.

Cross-examined by Mr. WILLOUGHBY: It broke because there was not sufficient support for it, the ground being loose. The other portion of the pipe was doubtless left in the ground, and a collar placed over it. When the pipes were laid down there was a proper bed; we should not lay them otherwise. We should refuse to light a road unless the bed were in a good condition, and we always make an examination first. Having laid a main, we do not take the trouble to open the road unless it is necessary; but if the road was opened we should see that our interests were not interfered with. It is the first duty of an inspector to attend to the escapes of gas.

Mr. WILLOUGHBY: Would it not be advisable, to guard against anything of this sort, just to look after your pipes occasionally, to see whether they had subsided from time to time.

Lord COLERIDGE: Do you mean to infer it is the duty of the Company, from time to time, to make subterranean examinations to see the state of the pipes?

Mr. WILLOUGHBY: If it is the inherent nature of the earth that it should subside, and the Company know it, it is their duty to look after it, and take certain precautions.

Lord COLERIDGE: That would involve a new terror to the residents, because you would have the ground turned up every fortnight.

Mr. WILLOUGHBY: But if your lordship takes the other alternative—either to have an explosion or be poisoned—you will see the value of it.

Lord COLERIDGE: Everybody agrees that where there is an escape it ought to be attended to. That is only common sense.

Cross-examination resumed: I heard Emmett and Jackson say the trench was composed of rubbish, but I say it was not; it was so solid that a bar could not be got down 2 feet, while it could be got down 5 feet under the cutting. The ground in other places was very sweet, and there was no sign of any escape. If the earth which was produced in the bottle was all that could be collected, it was not much.

Mr. *Alfred Grundy Windsor*, examined by Mr. PAINE, said he was an Architect and Surveyor, and attended in Ellesmere Road on Feb. 25, 1879, and took measurements opposite No. 50, with a view to making a plan, which he produced and explained.

John Edwin Edney, examined by Mr. PAINE, said he was a service layer in the employment of the Gas Company. In 1873 he laid a service from the main to the premises in question, and in 1874 it was disconnected, and the main plugged in a proper manner. To do this it was necessary to open the road, and at this time there was no escape of gas apparent. On the day of the accident he was on the spot before the road was opened. When an opening was made a fracture was found in the main-pipe at a distance from the supply-pipe. The ground was solid underneath the main on each side where the service went in, but underneath the main, where the fracture was, it was very light—anything could be pushed through. It was repaired with a slip collar, and witness remained in charge till the following morning. Whilst there he saw no furniture removed; only a bundle, which looked like bedding.

Cross-examined by Mr. WILLOUGHBY: The Company only carried the pipe up to the iron railings, and there left it. When the pipe was disconnected, they took the band out of the main and plugged the main up, so that nothing from the main could get into the service-pipe. The point of fracture was about 5 or 6 feet from the plug, and a good deal of gas might have passed through it. He had no recollection of the pipe sinking in another portion of the road in 1870.

By the JURY: The landlord or tenant would lay the pipe from the front railing to the house, and in doing so would cut a hole in the brickwork. If that hole had been stopped, it would have kept a great portion of the gas out. It was the duty of the landlord or tenant to see that the hole was properly stopped up.

James William Newman, examined by Mr. PAINE.

I am a foreman of main-layers in the service of the defendant Company. On Dec. 17, 1878, I went to Ellesmere Road, and found that the ground had been opened, and it was quite soft under the fracture. On the following day we took out the fractured piece of the pipe, and replaced it by a new piece 6 feet long, which is an every-day occurrence. The piece of piping which has been produced came from Ellesmere Road. We always save the pieces where there is a breakage, and send them to the stores to be preserved, and that was done in the present instance. There was no connection between the service-pipe and the main on the 17th. I have inhaled gas on many occasions, but never found it had much effect on me after a night's rest.

Cross-examined by Mr. WILLOUGHBY: I went into the house after the accident and saw the service-pipe, which was fixed behind the front door, but that was not the Company's pipe. There was, no doubt, a ticket upon it, stating that if it was removed a reward of £5 would be given for information about its being removed, but such a ticket is always affixed to cap the service, so that it shall not be tampered with.

Mr. *John Hall*, examined by Mr. MORGAN HOWARD.

I am a Vestryman of the parish, and lived in Ellesmere Road in the year 1866. I was the instigator of the main sewer being made down the road. The houses were being built at the time, and we connected them with the sewer as fast as possible, open cuttings being made for the purpose. The ground was excavated at places underneath the gas and water mains, which were filled in by the person who had the contract to construct the sewer. At that time the parish had not taken to the roads; but in the early part of 1865 the cholera set in, and I called a meeting of the inhabitants, and we waited on the Vestry and asked them to put in the drains, because many of the houses had cesspools for draining into, right in front of the road. The Vestry agreed to do so on our paying two-thirds of the expenses. The excavations were filled in as they generally are. The men who undertake these jobs will take all the sand they can, and fill in with all the rubbish they can get hold of. I saw the main exposed in 1879, and inspected it, being at that time on the Works Committee of the Vestry.

Cross-examined by Mr. WILLOUGHBY: The rubbish is not allowed to be used if the Vestry have taken the roads. In 1864 the Metropolitan Board did not supervise matters of this sort, but they do now. It took about three weeks to lay the main drain, which was only a 3-inch pipe, and the road was open all the time.

By Lord COLERIDGE: The main drain went down the centre of the road, and it was the side drains that did the mischief.

Cross-examination continued: Most of the people made their connections with the sewer as it went on where they had cesspools, and in order to do that they would pass over or under the gas and water pipes, and they were supported on each side by the earth; nothing would be put under them to support them.

Mr. *Henry Carter*, examined by Mr. PAINE.

I am resident inspector of the district. Before the accident no complaint was made to me of any escape of gas in the Ellesmere Road, but as soon as I received information I went to the scene of the occurrence. I have heard the evidence as to the state of the pipe and of the ground immediately under it, and I perfectly agree with it. After I had been on the premises about an hour or an hour and a half, searching for the escape, Mr. Johnson walked with me down the street. At that time he answered my questions much better than he did those of the Attorney-General yesterday. The piece of pipe which was taken out was sent to my office, and is the same as that produced.

Cross-examined by Mr. WILLOUGHBY. The ground had sunk at some places along the road, but we cannot tell where it is falling in; it is a thing which occasionally happens, but not very often. If the ground sinks the pipes are liable to be broken or drawn from their sockets. If I saw any subsidence of the road, whether the gas was escaping or not, I should look after it to see that there was no breakage of the main. I have seen such a thing about half-a-dozen times in the course of a year. The road in question was made when I first saw it, but I do not know that it was a brickfield or what it was previously. The houses were all built when I first knew it.

Mr. *Theophilus N. Bird*, examined by Mr. PAINE.

I am a district inspector of the eastern division of the Gas Company's district, and on Dec. 17, 1878, was summoned to the spot in question. When I arrived the workmen had opened the ground. I inspected the hole and the soil underneath, and agree in the main with what our other witnesses have stated. The main was stripped under my directions, and I never saw a pipe in better condition after being in the ground so long. We have pipes in use now that have been in the ground for upwards of 40 years, but that pipe had only been in for 16 years. In 1879 the pipe was tested throughout its entire length, and was perfectly sound except at one spot, which was where the first syphon was placed. At that time the East London Water Company were laying a 3-inch water-pipe within 3 feet of the leakage at that spot. I also applied a spirit-level to every length, and found the pipe in such excellent condition that we filled in the ground without disturbing or altering a single pipe. I saw the piece which was removed, and it is the same as that now produced. My experience of ramming made soil is that it can never be consolidated as firmly as the native earth.

Cross-examined by Mr. WILLOUGHBY: The pipe taken out did not present the appearance of having been previously used; it broke on account of the subsidence of the soil. There had been an accident of a similar character in the same road on Dec. 6, 1879.

Mr. MORGAN HOWARD objected to the line of cross-examination.

Mr. WILLOUGHBY said he was entitled to show the condition of the whole length of pipe along the road.

Lord COLERIDGE said that if Mr. Howard objected he should reject the evidence, but the objection was not persisted in.

Cross-examination resumed: A report had been made on the subject of the main being broken. It was well known in the neighbourhood that the site in question was originally a brickfield, and that the soil was soft, but it was in every respect suitable for the pipes to lie in.

Mr. *George Wilson Stevenson*, examined by Mr. PAINE.

On Feb. 24, 1879, I attended by appointment at the Ellesmere Road, when the main-pipe was stripped from end to end. A shaft had been sunk immediately opposite No. 50, and I saw the place where the pipe had been fractured and mended. The soil was very loose, and I saw a crowbar put down to a depth of 4 or 5 feet—in fact, as low as it would descend, whilst the soil adjoining was quite hard. The surface soil was quite right, it being macadamized. The soft soil came up to the under side of the macadam.

Mr. PAINE: Supposing the Company had notice in 1866 that the made soil had been placed there, would it have been possible for them to have so packed it that there could not have been a subsidence subsequently?

Witness: I think it would have been impossible for them so to ram the soil as to make good the defective filling in, so that it would have been as good as the undisturbed native soil. From inquiries, I was told that the house drain had been made partly by tunnelling and partly by excavation, and I think it is quite impossible to fill in the tunnelling so effectually as an open cutting. My opinion, therefore, as to the cause of the subsidence was that the men, after doing the work, had contented themselves with loosely filling in, and that in consequence the ground had subsided and broken the pipe. This would not necessarily have been apparent from the surface of the road, because the macadam would have formed a hard crust. I examined the pipes, and am bound to say I never saw a better lot or a set of pipes better laid than these were. They were made by the Staveley Iron Company, and laid by Messrs. John Aird and Sons, and altogether the work was admirably done. As to the life of pipes, in rating cases we take 70 years, but it varies very much from the nature of the soil in which they are laid. The soil in question was very suitable for the lengthened life of a pipe. If a pipe were laid in a cinder sub-soil, its life

would be cut down by 20 or 25 years, because it would become oxidized. There is absolutely neither ammonia nor sulphuretted hydrogen in gas; in fact, the latter is prohibited under very serious penalties, and the former is taken out for profit, it being turned into sulphate of ammonia and sold for manure. Nothing would disclose a settlement of the ground except the actual opening of the road, and to suppose that this could be done periodically year by year, or even at periods of five years, would be absurd. I do not suppose the ratepayers would tolerate it for a moment.

Cross-examined by Mr. WILLOUGHBY: The drain over which the improper soil lay ran from the house to the main sewer down below. The width of the shaft was about 4 feet—large enough to move about in. I do not know how far the earth was loosened, but it was all loose in the immediate neighbourhood. The crowbar was put down between the pipe and the house, and also close to the pipe.

Mr. *Robert P. Spice*, examined by Mr. MORGAN HOWARD.

I heard the evidence of the last witness, and entirely agree with him. I may add that I have had many hundreds of miles of gas-mains laid under my supervision within the last 38 years, and I have never seen a better sample of pipe-laying, or a better quality of pipes than those in Ellesmere Road.

Cross-examined by Mr. WILLIS: The soil was very good, and there appeared no chance of the pipe subsiding, unless the soil beneath was taken away, which was what happened in this case.

Mr. MORGAN HOWARD said he had other witnesses of a similar character to the preceding, but would not call them unless necessary.

Dr. *George Hastings*, examined by Mr. PAINE.

On Feb. 11 of last year I saw the plaintiff and his family on behalf of the Gas Company, and I found very little the matter with them. The plaintiff told me of several of his sufferings, but I found no physical signs to account for them. The accident having happened two months before, I should say it was impossible for a gassy taste to remain after that length of time. At that time the wife and children were perfectly well. I have studied gas poisoning, and it is not my opinion that a powerful heart would be affected by the inhalation of gas. The patient would become insensible, and suffer loss of muscular power; but as soon as he came to, the muscular power would return. The fact of the man walking about on the day of the accident would show that it must have been a very slight attack of poisoning.

Cross-examined by Mr. WILLOUGHBY: Coal gas is a very disagreeable thing to inhale, but I do not think there was any sulphuretted hydrogen in it; at any rate, there ought not to be. The power of the lungs in absorbing gas is very great.

By Lord COLERIDGE: I never heard of a case of permanent injury being suffered by anybody from the effect emanating from coal gas.

Dr. *Charles Meymott Tidy*, examined by Mr. MORGAN HOWARD.

I have had considerable experience in coal gas poisoning, and also in the analysis of coal gas. Of all the constituents of the latter, carbonic acid is the one most to be feared, as it is the most poisonous compound. In unpurified coal gas traces of sulphuretted hydrogen may be found, but in purified coal gas there is not a trace. The operation of carbonic oxide is only upon the blood, and if that be expelled by the action of the lungs, there is an end of it. In very bad cases I have seen recovery take place after three days, and I have also seen the symptoms last to the end of the fourth day, but I have never known of an instance in which they have lasted over a week. I am quite clear upon the point that a man who is able to walk about the day after he has been acted upon by gas could not possibly have been in any very severe measure under the influence of it primarily.

Cross-examined by Mr. WILLOUGHBY: The constitution, of course, may have something to do with it, but not much in a case of volatile gas poisoning, because it is a poison taken into the blood and given off by the blood without any action on the tissue. I am assuming that the gas is that ordinarily supplied by the Company to the public, with the composition of which I am perfectly familiar, and which I know to be absolutely free from sulphuretted hydrogen. The Company may have been occasionally summoned for having sulphuretted hydrogen in their gas, but it was an accidental circumstance if it did happen. The Company have had an injunction granted against them, but in that case the complaint was that in purifying the gas from sulphuretted hydrogen it was necessary to use lime, and in the form of a sulphide the sulphuretted hydrogen was given off from the lime in the purifier. It had nothing to do with the gas, and the whole question arose from the nuisance emanating from the purifiers. The Act of Parliament is perfectly distinct upon this point, that there shall not be a single trace of sulphuretted hydrogen, and we test for it by allowing gas to blow upon a small piece of lead paper. Inhaling sulphur is not in the slightest degree injurious. Carburetted hydrogen is also perfectly innocuous; in fact, I should be prepared to drink a bottle of it at the present time. As a proof of this coalminers breathe it daily without it in the slightest degree affecting their health.

This being the case for the defendants,

Mr. MORGAN HOWARD said he had only a few observations to make. In the first place he submitted that it was a speculative case on the part of the plaintiffs, but if the jury thought he was entitled to anything in the shape of damages, they would have to consider who the person was that they had before them. He was not a large fish salesman, in the sense in which such a term was generally understood, nor was he a man who had anything at all approaching the income which had been stated. He had produced neither books nor vouchers, and but one witness who could give the faintest evidence with regard to his business; and anything more shadowy than that which had been placed before the jury by a plaintiff whose duty it was to do so he had never seen. He said that he had been very seriously hurt; that he had suffered very great injury; and that his heart was affected. It was to be regretted that he should have been annoyed for a moment by this escape of gas, but these were things which all must suffer from. Slight accidents of this kind were constantly occurring, and such cases must be approached by the jury as men of the world, and not from the point of view of a plaintiff who rushed too quickly into the hands of an enterprising solicitor who thought he had a case for making this great Company liable for an accident against which it was simply impossible for them to have taken precautions. The damage sustained by him might be judged by the fact that he was able to go out the very next day. His own evidence was that he was so greatly incapacitated by the effects of the gas that he lost his business; but this point must be left with the jury to determine, according to their own views. It was pretty clear that he was a man in a small way of business; and he could not, with the evidence brought forward, sustain the plea that he had suffered any permanent injury. The effect of the gas had caused a functional derangement merely, and not one of an organic character, and on this point the jury had heard the evidence of two of the most eminent doctors in the Metropolis. They had before them the case of a man for a brief period rendered insensible by gas, but who immediately afterwards said, "I will bring an action against the Gas Company; I will not write a single letter to them; I will give them no notice; I will not give them the slightest chance of negotiating with me; but, ill as I am, upset as I am, suffering from heart disease as I am, I am going straight away to my attorney," who, with the zeal and enterprise of his profession, put himself into communication with the Gas Company, and the action was thus brought forward. The question substantially was, what transpired at the laying of the sewer in 1866? It had been proved in evidence that unless a series of subterraneau excavations had been resorted to, such an event as had happened could not be guarded against. But was there not abundant evidence to prove that the Company had been vigilant? Directly after they heard of the escape they took steps to remedy the defect, and were on the spot, and had the pipes laid bare. Mr. Johnson had tried to make out that the pipe was rotten; but did the jury believe it was so, or anything approaching it? The jury might be left to form their own opinion whether it was not a well-made pipe, which had been subject to all reasonable tests. They also had it upon the testimony of eminent scientific men that there was not a trace of ammonia in the gas. The witnesses one and all said that better pipes they never saw, nor more excellent laying. It might be asked how the accident was to be accounted for. As his lordship had said, were the Gas Company to undertake a perpetual series of peripatetic investigations, breaking up every street, and laying open th epipes throughout their whole system from time to time, in order to see that there was not a momentary escape of gas? They had been told by the very eminent engineers who had been examined that the Company could not, even if the escape had been found out, having regard to the manner in which the house drainage was constructed, bring the soil back to the state in which Nature had originally made it. It might be that there was a single escape of gas, consequent upon a single subsidence of the ground, but how could the Company help it? It was an important case for the Gas Company—nay, more, it was an important case to the whole of the public whose interests were confided to them for the purpose of lighting the Metropolis; and the duties of gas companies would be simply intolerable if such labours were to be imposed upon them. The pipe was proved to have been sound in October, 1878, and the jury could easily draw an inference from the condition in which it must have been at the time. The Company had been to all sorts of trouble and expense in putting things right, and he (Mr. Morgan Howard) was driven to the conclusion, that if there was any escape of gas in the house, it might have been from the not very well constructed brickwork of the wall. The drainage had been formed without any notice to the Gas Company; and even if they had had notice, practical science did not enable them to take care that some isolated escapes should not take place. With these observations he left the case in the hands of the jury.

Mr. WILLOUGHBY, in replying upon the whole case, said he ventured to lay down the proposition that every person had a right to have his house unpolluted by injurious vapours, and that unless the persons who polluted his house could show that it had been done in the exercise of some lawful trade, properly carried on, he was entitled to compensation, not only for any injury his health had suffered, but for any loss which he might have been put to in consequence of it. It was quite true that gas companies had very great powers; but, on the other hand, the public and the Legislature were entitled to see that their powers were carried out in a fair and proper way. Two things they were bound to do—to maintain their pipes in a reasonably efficient and proper condition, and to take proper precautions to protect the health and the lives of the people who happened to live in the immediate neighbourhood of the places where their pipes were laid. Supposing there had been an explosion, could it be said that the Gas Company were to get out of their liability unless they could prove that they had taken every proper precaution, and that the accident was an unpreventible one? It had been given in evidence that the pipe was laid in 1864, and the scientific gentlemen who had been called had stated that they had never seen pipes better fitted for the work for which they were intended to be used; but if this were so it seemed an astonishing thing that the accident should have happened at all. It was not, however, altogether immaterial to consider the whole service of pipes in this road, and if there had been accidents at any other point, it was material to show that it was a faulty service at that spot, and that they had a character for the crimes, so to speak, which those pipes had committed. In 1869 an accident from that excellent service of a very similar character happened; and in 1872 another accident occurred in the same road. In 1869 and 1870, also, the road had sunk, and had to undergo repairs. What did that mean except that the road was faulty in some portions, and that the Company did not look to their main pipes as they ought to have done? It was not merely sufficient to place pipes in the road and let the gas go through them. The Company were bound to lay their pipes in a reasonable and proper way, while the places in which they were laid down should be in as good a condition as it was possible to make them, so that no danger might ensue to the neighbourhood; but it had been distinctly stated that the soil in which these pipes were laid was improper—that it was unsound and treacherous, and that it might give way. There was, of course, the usual contradiction which they always found in cases of this description, but it was for the jury to say which party was telling the truth. If the soil was so perfect, why was it that pipes had sunk and become fractured? It was well known that the servants of a gas company always approached these matters with a certain amount of bias, and their statements, when sifted, were not always found to be accurate; but there were documents which could not deceive. One report stated that, in 1869, the main was found to have sunk, which showed that the soil in that part of the road was treacherous, and in February, 1870, the same thing happened again; so that these documents strongly corroborated the evidence given by the plaintiff's witnesses. The Company's argument was that they laid down the main in a proper manner in 1864, but the evidence did not bear out this statement. In the year 1866 the drains were put in, and it was stated that the good soil was taken out and rubbish inserted in its place; and it was submitted that it was the duty of the gas and water companies to have watched carefully any operations going on in the road, and to see that they were not prejudiced by those operations, not only for their own sakes, but for the interests of the public; but the Company did not pretend that they ever went near the property in the year 1866. In 1873 the Gas Company fixed the service for the then tenants of the house, and in order to do so they must have dug down to the level of the gas-pipe, and they had then full opportunity of seeing the state of the ground; and if it had been treacherous, there were full opportunities of seeing it. If, therefore, they neglected that opportunity—as they undoubtedly did—they were responsible for the accident which had taken place. In 1874 the same opportunity occurred again, because then they disconnected the service they had previously laid in 1873. It was very well to say that the earth was not properly rammed down in 1866, but there was no reason why the observation might not equally apply to the Company themselves, because by disturbing the earth in the way they did they were far more likely to have interfered with the soil, and not have reinstated it in the safe and proper condition it was in before. The Company were, however, guilty of neglect in other ways, because prior to the accident, there was evidence of distinct and positive notice having been given of an escape of gas in the neighbourhood. It was true that this was contradicted by Mr. Carter, but there was the evidence, and if it was accurate the Company could not shuffle out of their liability. Another proof was that it had been ascertained that the service-pipe, although not actually belonging to the Company, was under their

control, as evidenced by their placing a notice over it warning any person against tampering with it. Something had been said about stopping up that hole; but whosesoever duty it was that this should be done, it had nothing to do with the plaintiff. The Company had recognized their dominion over the pipe, and therefore the plaintiff could not very well have stopped up the hole. The negligence of any other person would not at all prejudice any right the plaintiff might have, because he stood in a very different position. With regard to the case of the wife and children, the case had never been presented as one of a serious character. Those persons had said they suffered but little, but still for that little they were entitled to compensation. He (Mr. Willoughby) did not say the damages in those cases should be large—in fact, it would have been better that their names should not have been introduced—but their claims had been put in, and would have to be dealt with. Coming to the plaintiff's position, it was undoubtedly the fact that he slept in, and inhaled the gas for a considerable time. Was that a pleasant thing to do—was it injurious, or was it not? Doctors had been called in, and they differed, as they usually did in such cases; but the jury must exercise their own good sense in the matter, and say how far the case was a genuine one or not. A young man carrying on a fairly good business at Billingsgate Market was suddenly struck down, and his system impregnated with coal gas. It might be, as Dr. Tidy had stated, that the gas was made of such excellent ingredients that sulphuretted hydrogen was never found in it; and as to something else which was in it, it was so innocuous that the Doctor seemed rather to like it, and said he would be happy to drink a bottle of it. That gentleman said that if it was dangerous it was only slightly so, and his whole evidence amounted to the statement that he had never heard or read of a case in which the patient did not recover within a week: but the good sense of the jury would tell them that this must depend upon the quantity inhaled, and also, to a great extent, upon the constitution of the person who inhaled it, as well as the ingredients of which the gas was composed. The evidence of Dr. Abbott, however, was distinct and positive. He said the man was not shamming at all, and that he was really laid up for five weeks from the effects of gas poisoning—that his system was impregnated with it, and that his heart was feeble. Of course, as it was now two years since the accident took place, the plaintiff had practically recovered; he was in a very different condition, and there was nothing much the matter with him. It was quite impossible to believe that a man sleeping in an atmosphere of this kind, and being found in a state of insensibility, would not suffer more serious effects than Dr. Tidy seemed to think. On the head of damages, he (Mr. Willoughby) contended that the plaintiff was entitled to a fair and reasonable sum for the expense he had been put to, and also for the loss of business and loss of health he had sustained. If a man embarked in a career which chiefly depended upon his own exertions, and was in any way incapacitated from attending to it, he found upon his return that his customers had gone elsewhere, and he had to make over again a business which at the time he was struck down might have proved a very good concern. That was what had occurred here. The figures given were something like £2 or £3 a week falling off, or about £100 a year from the time the accident happened to the present, and this was fairly to be considered, quite apart from the three months during which he was prevented more or less from attending to his affairs. In conclusion, it was submitted that the accident had arisen from the neglect of the Gas Company to take ordinary precautions, and they were therefore bound to compensate any one who had been injured through that neglect.

Lord COLERIDGE commenced his remarks to the jury by making some strong comments on multiplying the number of plaintiffs in cases like the present, the object of which might be summed up in one word—"Costs"—because there was no doubt the benefit which would accrue to the legal advisers would be ten times greater than any possible damage that could be supposed to have accrued to either of the plaintiffs in either of the actions. The first question was, had there been any negligence on the part of the defendants? If not the actions failed; but if there was any negligence, the next question was, what injury the plaintiffs had suffered, and what compensation they should receive? The term "negligence," in a matter like the present, meant the omission to do something which a reasonable man would do, or the doing of something which a reasonable man, guided by like considerations, would not do. The plaintiffs stated that the defendants were a large and powerful Company, and this might possibly explain the fact that they had two actions, two sets of briefs, two attorneys, and two sets of costs. Happily, however, costs were in the discretion of the judge, and the jury would hear what his judgment would be, at all events, in one of the cases, because it was an action which, in his opinion, the Court ought never to have been called upon to try. The plaintiffs case was that they were perfectly innocent, and, as they believed, protected from all connection with the main; but the gas found its way into their house and caused all the damage, and for that damage they would trouble the Company to pay so much as was right and proper under all the circumstances. The defendants said they did not dispute that the gas was made by them, and transmitted to this particular place, when one of their pipes broke, and that there was a considerable escape of gas from the pipe, which somehow or other got into the house; but for the breakage of the main they were not answerable, because it did not arise from any negligence of theirs; and if the defendants made out that defence, they were entitled to succeed. In a case like the present the onus lay on the plaintiff, who must show some act of negligence; he must put his finger on some act done wrongfully, or wrongfully omitted to be done, on the part of the defendants; and if he did not do that he did not discharge the burden which the law cast upon him, and he must fail. Did the plaintiffs in this case sustain the burden? As to the breaking of the main and the escape of gas there was really no dispute, and no answer was attempted to be made, and therefore the plaintiffs on this point had a case to lay before the jury. But the defendants said that the pipes were of the best quality, and laid by one of the best firms, in soil which afforded an excellent bed for them. It might be taken that reasonable care would be exercised by the Company, because otherwise they would be perpetually in danger of something happening to them, and the expense of keeping them in a fit and proper condition would, in the long run, be much greater than if they had made a proper outlay at first. They then said that after the pipes had been laid for a couple of years, a system of sewerage was carried down Ellesmere Road, and drains were formed connecting the sewer with the houses. It was not suggested that the making of the main sewer had anything to do with the damage which was the cause of the action, because the sewer was in the middle of the road, while the water and gas pipes were laid rather nearer the kerb. But the surface drains from the houses led at uncertain intervals from the houses into the main sewer, and of course they had to be carried under the water and gas pipes for the purpose of connecting them with the sewer; and the Company's contention was that at this particular spot the excavation made for that purpose had not been properly filled in, and so let down the pipe that at last it cracked and broke altogether. If that were so—and there appeared no reason to doubt that this was the *causa causans*—the question was, could the defendants by reasonable care have prevented it? If they had known beforehand what was going to happen, and if by some known mode of operation they could have prevented the possible sinking of their pipe, there would have been reasonable evidence of negligence to be left to the jury. But what had been proved was that, as a matter of fact, when the pipe was taken up it was found lying in ground which was not the original earth, but rubbish which was liable to become compressed by the lapse of time, and that there was no known means of remedying this defect. The defendants said it was not as if those works had been carried on at well-known times, when they might have had notice of them, but they were done at uncertain times, and it was not pretended that notice had been given. They also said it was impossible, when work was done in such a way, to prevent the pipes from sinking and cracking in consequence of the inferior stuff put under them. Mr. Willoughby had said that the mains ought to have been looked at from time to time, and had this been done, the breaking might have been stopped; but it was preposterous to suppose that, as a matter of fact, gas companies could have their whole system of pipes perpetually being dug up to see whether there was anything the matter with them. One of the plaintiffs witnesses had stated positively that he had gone to the Company's office a week beforehand, and told them there was an escape of gas at this very spot, and if that were so there was great evidence of negligence. Mr. Carter, however, gave this statement a most distinct and definite contradiction, and it was for the jury to say which of the two witnesses they believed. If the Company had had warning, it was very odd indeed that they had taken no notice of it. They knew perfectly well what to do in the event of an escape. On previous occasions escapes had been remedied at once, and it was difficult to understand why Mr. Carter should have neglected his duty on the present occasion. Apart from this, if the jury believed the evidence of the defendants, his lordship said he had great difficulty in seeing what it was upon which counsel for the plaintiffs could put his finger and say, "This is an act of negligence." Something had been said about the condition of the pipes, that they were very bad in themselves, irrespective of being broken down; but two of the plaintiffs own witnesses had admitted that they were in a very good state. A piece of the pipe had been produced which had been practically traced from the spot where it was taken out of the ground to the court. Mr. Jackson said it was not the same piece of pipe, but perhaps he really saw some other piece, and this would be a way of reconciling his evidence with that of the other witnesses, when he said the pipe was in bad order. Evidence had been called as to the state of the pipe at other parts of the road, but what real light could it throw upon the state of a pipe at one place to show the state of another pipe at another part. As to the question of damages, supposing the defendants to be liable, for what amount would they be so liable? On this point his lordship remarked that he did not like to say all he felt, because the amount would be for the jury to consider. The first plaintiff's own account was very serious indeed. He said he was rendered insensible, that he was not able to attend to his business at all for five weeks, and not able to attend substantially for three months, and that, when he went back afterwards, he could not attend to his business so well as he did before. He also said he was making profits to the amount of £10 a week, and that the whole of this was lost for a period of five weeks; and he likewise stated that he was not by any means well at present, in which statement he was confirmed by the two doctors who had been called on his behalf. [His lordship read several extracts from the evidence of those gentlemen.] On the other hand, they had the evidence of two scientific witnesses who were called for the defence, and they both stated that the case could not be maintained. Neither of them denied that if a person inhaled gas long enough it would kill him, but they said that if after the inhalation the patient went out into the fresh air, the effect would soon be got rid of by exhalation. Dr. Tidy said—and he was confirmed by Dr. Hastings—that the effects of coal gas, when it did not kill, were, according to the best experience, exceedingly transitory. Science was altogether apart from common sense, and there were many matters which scientific men understood, but which unscientific men did not understand; but there were also matters of simple elementary knowledge, and bringing that knowledge to bear upon the present question, one saw the sense of what those two gentlemen had told them—viz., that if they got the coal gas out of the system, they, at the same time, got rid of the effects. This was the evidence as given on one side and the other. If the jury thought the plaintiff had been exaggerating as to his loss of trade and profits, they might also think he had been exaggerating as to his personal sufferings. He said he had been making a profit of £520 a year; but supposing they took off £50, or £100, or even half—if they thought he was making a profit of £250—it was for them to say what they thought he was entitled to. There was nothing to guide them; there were no accounts, not even a banking book. It might perhaps be suggested that he had kept no books in order to avoid paying income-tax, but possibly after the present case he might have to pay that tax. However, he had not produced books, and said he could not give a fragment of documentary evidence in the shape of an account, or any piece of paper to show that he had been making anything like the sum stated. If the jury thought he had been grossly exaggerating in any one matter upon which they could place their fingers, then from that they could judge whether he was likely to have exaggerated in others upon which they could not bring him to book, and, unfortunately (added his lordship), "as I have pointed out to you, there is no book to bring him to." With regard to the other plaintiffs, they must be left in the hands of the jury, as they did not appear to have been much the worse for the accident, although Miss Hannah said she had the taste of onions—and, what seemed to give a new terror, bad onions—in her mouth for months. With regard to the damages, the parties were all in the house, and they all seemed to have suffered in some way from the escape of gas; but how much they had suffered—or, in the case of the ladies, how little they had suffered—it was for the jury to say. There were two cases before them, and they would have to take both into consideration. If they should find in favour of the plaintiffs, they would have to consider the whole of the five or six separate cases. They had all breathed the gas, and were all entitled to something if the Company were proved guilty of negligence with regard to their pipes.

The jury having consulted in the box for about five minutes, returned a verdict for the defendants in both cases.

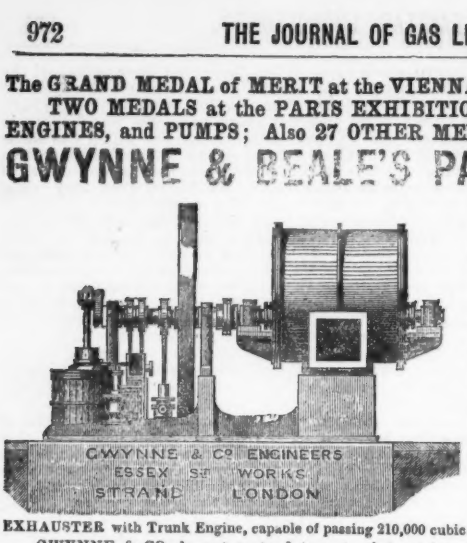
Lord COLERIDGE thereupon directed judgment to be entered for the defendants, and granted a certificate for a special jury.

ALDRINGTON ESTATE WATER COMPANY, LIMITED.—A Company with this title was registered on the 2nd inst., with a capital of £25,000, in £10 shares, to erect water-works and to supply fresh and sea water to the Aldrington Estate and neighbourhood, in the parishes of Aldrington and Portslade, in the county of Sussex.

CLEVEDON GAS COMPANY.—The annual meeting of this Company was held on Friday, the 11th inst.—Mr. J. Maynard in the chair. The report and balance-sheet were unanimously adopted, and a dividend was declared of 7 per cent. on the B shares, and 8 per cent. on the A shares, free of income-tax. Messrs. F. Gregory and J. Middle were re-elected Directors, and Mr. C. J. Ryland, of Bristol, Auditor.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

52,500 EXHAUSTER, with Horizontal Engine combined.

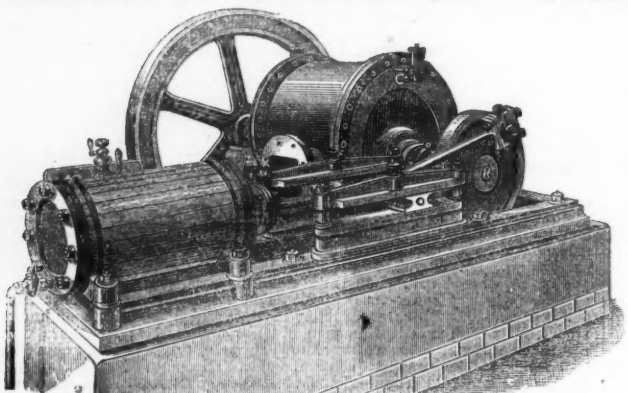
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH

Wrought-Iron Spindles and

ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 982.]

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by the Advertiser, a Situation as WORKING FOREMAN or in any place of trust. Has had every experience in Works making 80 million. First-class references.
Address No. 668, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a Young Man aged 25, and Married, a Situation as MANAGER of a small Gas-Works. Applicant has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches. Has had several years experience as Manager of a Works (make 15 millions). Has no objection to go Abroad. Satisfactory reasons for change.
Address No. 663, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser requires a Situation as GAS-FITTER, MAIN and SERVICE LAYER. Accustomed to General Work on Gas-Works.
Address No. 667, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HOLYWOOD GAS COMPANY, LIMITED.

WANTED, a Manager for the above Works. He will be required, besides taking the general management of the Works under the Chairman and Directors, to take the indications of the Meters. He must be competent to Superintend the Setting of Retorts, Laying of Mains, &c. Security will be required for the due discharge of the duties of the situation.
Salary not less than £90 a year, with house, fire, and light.
Applications, with testimonials as to character, ability, and experience, to be forwarded to the Chairman of Directors on or before the 28th inst.
THOMAS HUNTER, Secretary.
Holywood, Belfast, June 10, 1880.

WANTED, a Working Stoker, to take charge of a small Gas-Works in a country town. Wages must be low.
Apply to R. T., 3, Limes Villas, LEWISHAM.

WANTED, in a Suburban Gas Company's Office, a CLERK about 18 or 19. Must be a good Writer and quick at Figures. References required. Salary £50 per annum.
Apply, by letter, to GAS SECRETARY, care of R. Clarke and Co., 3, White Hart Court, BISHOPSGATE STREET, E.C.

BOROUGH OF ROCHDALE.

THE Corporation of Rochdale are prepared to receive APPLICATIONS for the Office of GAS MANAGER in that Borough at a salary of £400 per annum.
Candidates must have a thorough knowledge of the Manufacture and of the Distribution of Gas upon the most modern principles, and also be competent to Design and carry out such Extensions to the Gas-Works as may be required.
Applications, endorsed "Gas Manager," stating age and experience, together with testimonials, must be sent to me on or before the 29th of June inst.
By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, June 19, 1880.

GAS PLANT FOR SALE.

THE Committee of the Burton-on-Trent Corporation Gas Department have for Sale One Set of TWO PURIFIERS, 24 ft. by 10 ft., 3 ft. 9 in. deep, 12 in. Connections, and Two 12 in. Four-Way Dry Valves by Walker, Lifting Apparatus, &c.
One Set of TWO PURIFIERS, 14 ft. by 14 ft., 3 ft. 9 in. deep, and Six 12-in. diameter Valves by Young, Lifting Apparatus.
The above having been replaced by larger can be removed at once.
Further particulars may be had on application to the undersigned.
JOHN MUDIE, Manager.
Gas-Works, Wetmore Road, June 5, 1880.

GAS-MAKING FROM WOOD AND NAPHTHA.

COMPETENT Person Wanted, to make Experiments with Iron Retorts.
Apply, with full particulars of qualifications, to WILLIAM BLEWS AND SONS, Gas Engineers, BIRMINGHAM.

WANTED, the following Second-hand PLANT:—
A SCRUBBER, about 12 ft. high, 3 ft. 6 in. wide, with Water Tank and Distributing Apparatus, and 6-in. Connections and Four-Way Valve.
A PURIFIER, about 9 ft. by 6 ft., and 4 ft. deep, with Sieves, Lift, 6-in. Connection, and Four-Way Valve.
Price, &c., to be addressed to GEO. WHITMAN, Company's Office, Aspley Guise, near WOBURN.

ON SALE—The Cast-Iron Fire Doors, Mouthpieces, Ascension, H, and Dip Pipes, Hydraulic Mains, &c., belonging to six settings of six retorts; also One Station Meter to pass 8000 feet per hour (makers West and Gregson).
The above are in capital condition, and can be seen at the Gas-Works, Guildford. No reasonable offer refused.
Further particulars on application to Mr. LONGWORTH, Gas Offices, GUILDFORD.

GAS APPARATUS FOR SALE.

THE Gas Committee of the Town Commissioners of Newry are desirous of receiving TENDERS for the Purchase of the following PLANT, which has been taken down to be replaced with apparatus of a larger size:—
8-in. Condenserr, 20 pipes, and Tar Box with overflow-pipes complete.
Five 8-in. Rack-Valves and 8-in. Connection Pipes and bends for Bye-pass complete.
Two Purifiers, 10 ft. by 12 ft. by 4 ft. deep.
Two Purifiers, 8 ft. by 8 ft. by 4 ft. deep.
8-in. Connections, Litt, Screws, and Travellers. One Hydraulic Centre-Valve suitable for four purifiers.
Tenders to be forwarded to the undersigned.
JOHN KERNAGHAN, Secretary of Gas Committee.
Board-Room, 6, Marcus Square, June 9, 1880.

FOR SALE.

GASHOLDER Sheets and Framing, 40 ft. diameter by 16 ft. deep; capacity about 17,000 cubic feet. In excellent condition. Will stand well to be re-erected.

Iron Roof, 65 ft. long by 27 ft. span. Inside walls in good condition.

Hydraulic Main, Cast Iron, 22 in. deep by 20 in. wide and about 61 ft. long.

Apply to Subscriber, Montrose Gas-Works.

ROBERT RENTON, Manager.

June 12, 1880.

THE Redcar Gas Company have for Immediate Sale in excellent condition the complete PLANT of a discontinued Gas-Works capable of making up to 20 millions, any portion will be sold separately, comprising:—Gasholder, four Purifiers with Centre Valve and Connections, Scrubber, Condensers, Station Meter, Governors, Inlet and Outlet Pipes, Retort Fittings, Hydraulic Mains, &c.

Further particulars may be had on application to the undersigned.

M. FLIGG, Secretary.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—

SCRUBBERS.—One 5ft. 6 in. diameter, 15 ft. high. One ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.

STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 3½ Körting's Patent Jet Blower.

VALVES.—Two Cockey's Dry Central Valves for four Purifiers. One 12-in. Cathels's Four-way Valve.

The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately.

For particulars and prices apply to

W. L. ROBINSON, Manager.

Gas-Works, Coventry, April 17, 1880.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,

WILLIAM J. MOON, Manager.

Scarborough, March 5, 1880.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—

SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.

CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.

ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.

STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.

HYDRAULIC MAIN.—Six 3 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.

BRIDGE AND ASCENSION PIPES.—90 6 in. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.

RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.

For further particulars and price apply to

JOHN WEST, Engineer and Manager.

Gas Works, Maidstone, April 21, 1880.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
431 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.

Gas Office, Sheffield, March 25, 1880.

BUENOS AYRES GAS COMPANY, LIMITED, SIX PER CENT. DEBENTURES.

NOTICE is hereby given to the DEBENTURE-HOLDERS of the Buenos Ayres Gas Company, Limited, that the Half-Yearly COUPONS at the rate of 6 per cent. per annum, due on the 1st of July next, will be paid on and after that date at the Company's Bankers, Messrs. Prescott and Co., Threadneedle Street, London. Coupons must be left at the Bank three clear days for examination.

By order,

E. W. LAYTON, Secretary.

1, East India Avenue, Leadenhall Street,
June 17, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse powe with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair o Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

THE Newtown and Llanllwchacarn Gas Company, Limited, invite TENDERS for the Supply of 6000 Tons of Good GAS COAL, to be delivered when required.

Tenders to be accompanied with analyses, and to be sent in by the 8th of July next. Prices to include delivery at Newtown Station.

The Directors do not pledge themselves to accept the lowest or any tender.

Further particulars may be had on application to the Secretary, W. F. THOMAS.

ILKESTON GAS-WORKS.

CONTRACTS FOR COAL.

THE Ilkeston Local Board are prepared to receive TENDERS for GAS COAL for One, Two, or Three years as may be determined; to be delivered in such quantities as may be required, free at the Works.

Estimated quantity per annum, 2000 tons.

Sealed tenders, endorsed, must be delivered to me by five o'clock in the afternoon of Friday, the 25th inst.

The Board do not pledge themselves to accept the lowest or any tender.

By order,

WRIGHT LISSETT,
Clerk to the said Board.

Town Hall, Ilkeston, June 14, 1880.

ILKESTON GAS-WORKS.

THE Ilkeston Local Board are prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR produced at their Works during a period of One, Two, or Three years.

Sealed tenders, endorsed, must be delivered to me by five o'clock in the afternoon of Friday, the 25th inst.

The Board do not pledge themselves to accept the highest or any tender.

By order,

WRIGHT LISSETT,
Clerk to the said Board.

Town Hall, Ilkeston, June 14, 1880.

LUDLOW UNION GAS COMPANY, SALOP.

THE Ludlow Union Gas Company are prepared to receive TENDERS for the Supply of 1100 Tons of Best GAS COAL, delivered, carriage free, at Ludlow Station, between July 1, 1880, and July 1, 1881; at times and in quantities to be regulated by the Company's Manager.

Tenders to be sent in to the Secretary, Ludlow Union Gas Company, Ludlow, Salop, on or before the 30th inst.

The Company do not bind themselves to accept the lowest or any tender.

Ludlow, June 19, 1880.

TENDERS FOR COAL.

THE Directors of the Longford Gas Company, Limited, are prepared to receive TENDERS for the Supply of 350 Tons of Best GAS COAL, delivered free into railway waggons at North Wall, Dublin. One-half to be delivered immediately and the balance in September.

Sealed tenders, accompanied with analysis of Coal, will be received up to the 6th of July, addressed to the Chairman, Longford Gas Company, Limited.

Longford, Ireland, June 16, 1880.

CORPORATION OF THE BOROUGH OF NEWBURY.

THE Gas Committee of the above Cor- poration invite TENDERS for the Supply of 2000 Tons of Best GAS COAL, to be delivered on their new Siding at the Gas-Works, on the Great Western Railway, Newbury, for Twelve months from the 1st of October next, in such quantities and at such periods as the Manager of the Gas-Works may direct. Persons tendering are requested to name the Colliery from which they propose to supply, together with an analysis showing the chemical composition of the Coal, terms of payment, &c.

Tenders to be endorsed "Tender for Gas Coal," and to be sent in on or before Tuesday, the 29th inst., directed to H. B. GODWIN, Esq., Town Clerk, NEWBURY.

ISLE OF THANET GAS COMPANY.

Sale by tender of 200 New Shares of £25 each; being the first portion of Additional Capital authorized to be raised by Resolutions passed at a General Meeting of Proprietors held on March 27, 1880, in pursuance of the Powers of the Thanet Gas Act, 1877.

THE Directors of the Isle of Thanet Gas Company give notice that they will be prepared to receive not later than 10 o'clock a.m., on Friday, July 16, 1880, sealed tenders for 200 Shares of £25 each.

The capital now offered is required for the Extension of the Company's Works, and Erection of a New Gasholder to enable them to meet the increased demand for gas.

The existing paid-up capital of the Company is as follows:—

£28,000 Margate Consolidated Stock.
£7000 Loan Capital at 4½ per cent. per annum.

The Consolidated Stock and the New Shares to be issued are entitled to a Dividend of 7 per cent., to be increased or diminished 5s. per cent. for every penny charged in diminution or excess of the standard price of gas—viz., 4s. 2d. per 1000 feet.

The Dividend on the Consolidated Stock for the last 12 months was at the rate of 8 per cent. per annum, and the price of gas 3s. 6d. per 1000 feet. £645 Stock was sold by auction during the past year, and produced £1123 17s. 6d., being at a rate of premium of over 74 per cent.

Forms of tenders can be had at the Gas-Works, Margate, Messrs. Fuller, Marine Library, Ramsgate, and the hotels, and will be sent by post on application.

By order,

THOS. C. FULLER, Secretary.

THE Lisbon Gas Company invite Tenders for the Supply, free on board in Newcastle, of the quantity of First-class GAS COAL they may require from Sept. 1, 1880, to Aug. 31, 1881. Tenders to be sent to their Office in Lisbon not later than the 7th of July.

BATLEY CORPORATION GAS-WORKS.

TENDERS FOR TAR.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Soothill Gas-Works, situate near to the Great Northern and London and North-Western Railway Stations, for the period of One year from July 1, 1880.

Any further information may be obtained on application to the undersigned, to whom tenders, endorsed "Tender for Tar," must be delivered, not later than Tuesday, July 27, 1880.

The Committee do not bind themselves to accept the highest or any tender.

CHARLES EASTWOOD, Engineer.

Gas-Works, Batley, June 17, 1880.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company are prepared to receive TENDERS for the Supply and Erection of a Condenser at their Works at Rochester, according to drawing which may be seen at their Office, and specification which may be had on application.

Tenders, marked "Tender for Condenser," to be delivered at the Company's Office, 56, High Street, Rochester, before noon of Thursday, July 8.

The Directors reserve the right to reject any tender.

W. SYMS, Secretary.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Harrogate Gas Company solicit TENDERS for the Purchase of their Surplus TAR. Tenders to state price per ton of 20 cwt., delivered on rails into the Contractor's tanks, for One, Two, or Three years from July 1, 1880, weight to be taken over the Gas Company's weigh-bridge at their works.

Present annual quantity about 175 tons.

Tenders to be delivered not later than the 30th inst.

By order,

P. H. WILKINSON, Secretary.

Harrogate, June 17, 1880.

SUTTON-IN-ASHFIELD LOCAL BOARD—GAS DEPARTMENT.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Sutton-in- Ashfield Local Board are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing year.

The present annual make is about 80 tons, and any further particulars required may be obtained on application to the Manager.

Tenders, stating price per ton of 20 cwt. at the Works, to be sent to me, the undersigned, so as to arrive not later than Tuesday, the 29th inst.

By order,

G. H. HIBBERT, Clerk to the Board.

Clerk's Office, Clerkson Street, Mansfield,
Notts., June 19, 1880.

COMMERCIAL GAS COMPANY.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the Surplus TAR produced at their several Works for the Twelvemonth ending June 30, 1881.

The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less:—

At the Stepney Works, in the Regent's Canal, 860,000 gallons.

At the Wapping Works, in the Thames, 320,000 gallons.

At the Poplar Works, in Bow Creek (free waterway), 350,000 gallons.

The tenders may be for the whole or for one or more Works separately.

The Contractors must give security to remove the Tar as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.

The form of agreement to be signed, can be seen at the Company's Offices.

Tenders, sealed and endorsed "Tender for Tar," to be delivered here not later than the 1st of July next.

The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.

By order of the Board,

H. D. ELLIS, Secretary.

Commercial Gas-Works, Ben Jonson Road, E.,
June 18, 1880.

PADDINGTON PUBLIC LIGHTING DEPARTMENT.

TO LAMP-MAKERS.

THE Vestry of this Parish are prepared to receive TENDERS for the Supply of Six Dozen Glazed 14-in. Tin STREET LANTERNS, tops Glazed with Opal Glass. Pattern Lantern can be seen at the Works Department, Paddington Basin, between the hours of 10 a.m. and 4 p.m.; Saturdays, 10 a.m. and 1 p.m. The Lanterns to be made strictly in accordance with the pattern, and subject to the entire approval of the Inspector of Public Lighting.

The Vestry do not bind themselves to accept the lowest or any tender.

Tenders to be addressed to the Vestry of Paddington, endorsed "Tender for Street Lanterns," and sent in not later than 3 p.m. on Monday, July 5, 1880.

By order,
FRANK DETHRIDGE, Vestry Clerk.
Vestry Hall, Harrow Road, W., June 19, 1880.

Imperial
METER COMPY.,
LIMITED,
Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.
KING'S ROAD, ST. PANCRAS.
Formerly also (**Walter Ford**) at Gray's Inn Road.

BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—
1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. BOX,
Gas-Works, Crayford, Kent.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Now ready, price 18s., bound in cloth, gilt lettered,

THE THIRTY-FOURTH VOLUME
(JULY to DECEMBER, 1879,)
OF THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, AND SANITARY IMPROVEMENT.

CLOTH CASES, GILT LETTERED,
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WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

IMPORTANT TO GAS MANAGERS.

NATIVE OXIDE OF IRON
Direct from the Mines, always ready for prompt delivery.
Price Moderate.
Spent Oxide Re-purchased.

DEPÔTS:
COUNTY DONEGAL AND RUNCORN.
Apply to GEO. BREWSTER, FALCARAGH, COUNTY DONEGAL; or J. GOODWORTH, LEEDS, Manager in England.

Now ready, price 10s. 6d.,
AN ANALYSIS OF THE
METROPOLITAN GAS COMPANIES ACCOUNTS
For the Year 1879,
(In continuation of the previous Ten Years, 1869–1878,)
COMPILED AND ARRANGED BY JOHN FIELD,
FOR MANY YEARS ACCOUNTANT TO THE LATE IMPERIAL GAS COMPANY.
AND BY THE SAME AUTHOR,
THE COMPARATIVE AVERAGE ACCOUNT BOOK.
A few Copies of this useful Book remain on hand, and may be had at reduced charges of 15s., 10s., and 7s. 6d. each.

W. KING, Office of "Journal of Gas Lighting," 11, BOLT COURT, LONDON, E.C.
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THE PHILOSOPHICAL SOCIETY OF GLASGOW
WILL HOLD AN
EXHIBITION OF APPARATUS AND APPLIANCES,
To Illustrate the most recent developments in the Use of
GAS, ELECTRICITY, &c.,
For Lighting and other purposes, commencing the 28th of September and continuing till the 25th of October, 1880.

The Exhibits will be embraced under the following heads: (1) Coal Gas; (2) Oils, Oil Gases Candles; (3) Electricity; (4) Hydraulic Appliances; (5) Architectural Appliances; and (6 Miscellaneous Apparatus, all bearing more or less upon Lighting and allied purposes.

Detailed Prospectuses, containing information and Conditions for Exhibitors, and Scale of Charges for Advertising in Catalogue, may be had from the subscriber, who will also supply Forms of Application for Space.

JNO. MANN, C.A., Secretary to Committee.
154, *St. Vincent Street, Glasgow.*

Now ready, Second Edition, price 7s., by post 7s. 3d., the
GAS MANAGER'S HANDBOOK.
By THOMAS NEWBIGGING, M.I.C.E.

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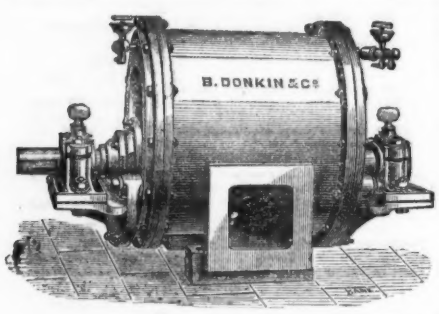

NEW PATENT GAS-EXHAUSTERS.
[J. BEALE'S.]
MESSRS. B. DONKIN & Co. possess the sole right to manufacture J. Beale's Exhausters under his new patent.

MADE WITH TWO OUTSIDE BEARINGS AND LATEST IMPROVEMENTS.

ALSO MANUFACTURERS OF
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N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

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ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

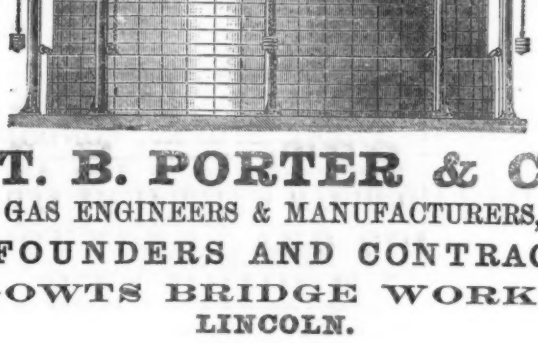
EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



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ESTIMATES FOR GAS-WORKS OF ANY SIZE.

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Price from Three-Farthings per Foot.

In any Lengths.

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OXIDE OF IRON.

Gas Companies can be supplied with any quantity of Natural Oxide suitable for Gas Purification purposes. Shipped direct from the extensive estates in Co. Donegal of the Earl of Leitrim and Wybrants Olphert, Esq., D.L.

By thus purchasing from the producer a constant supply of the purest material will be ensured to the Gas-Works, and intermediate profits will be saved to the Shareholders.

For terms, references, and particulars apply to

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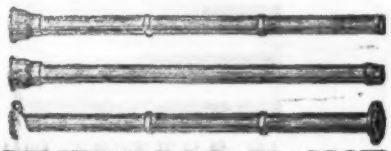

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Prices on application.

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ENORMOUS SAVING.

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Manufacture and Erect

HYDRAULIC CRANES

For Discharging Coal Barges;

WAGGON HOISTS

For Lifting Coals to Retort-House Stageway;

CAPSTANS

For Moving Trucks about the Yard,

And Apparatus for Lifting PURIFIER COVERS.

Examples to be seen at Beckton, Hull, &c., &c.

CAN THE HYDRAULIC MAIN BE ABOLISHED?

YES, very easily, by using

WHITE'S AUTOMATIC GAS-VALVE.

HERE'S PROOF:—

Gas-Works, Aberystwith, Jan. 24, 1880.

Mr. Wm. White, Abersychan, Mon.

Dear Sir,—The retorts fitted with your Valves answer very well. Our average make is 5600 cubic feet per mouthpiece, and we have no difficulty in producing 16-CANDLE GAS WITHOUT ANY CANNEL; although we formerly (with the old hydraulic dip-pipes) used a percentage to obtain that candle power. During the whole time they have been at work we have not been troubled with a choked ascension-pipe.

Yours respectfully,

J. DOUGALL, Engineer.

Mold Gas and Water Company's Works, Mold, May 28, 1880.

Mr. W. White, Gas Engineer, Abersychan.

Dear Sir,—After two years experience of your "Patent Automatic Gas Valve," which I consider a fair trial, I come to the following conclusions:—

1. That they are perfectly reliable as a complete seal.
2. An almost utter absence of back pressure.
3. Great freedom from deposit of carbon, some retorts not having been scurfed since adoption of valves.
4. They require no attention whatever, as we have not touched them since putting up.
5. The economy of your system is so great, and the evils it removes so many, that I would not return to the antiquated "dip" upon any consideration, and strongly recommend your method to the gas world.

Yours respectfully,

E. OWEN, Engineer.

NOTE.—Other testimony to follow. Illustrated pamphlet descriptive of the system sent post free for 6½d. in stamps, on application to the Inventor and Patentee as above.

BRILLIANT WHITE SILENT LIGHT.

WILLIAM SUGG'S
CELEBRATED PATENT GAS-BURNERS,

PREVENTING WASTE AND FLARING.

THE PATENT "LONDON" ARGAND,

The only Government Standard Burner for London and the Provinces, Canada and the Colonies, besides being largely used in the United States of America and elsewhere.

"THE VERY BEST BURNER YET CONSTRUCTED."—*Vide* GAS REFEREES REPORTS, 1869 AND 1871.

The "London" Governor Argand Burner and Westminster Shade and Screen.

The "London" Governor Argand Burner, Viennese Pattern Shade and Screen.

BRONZE MEDAL, PARIS, 1867.

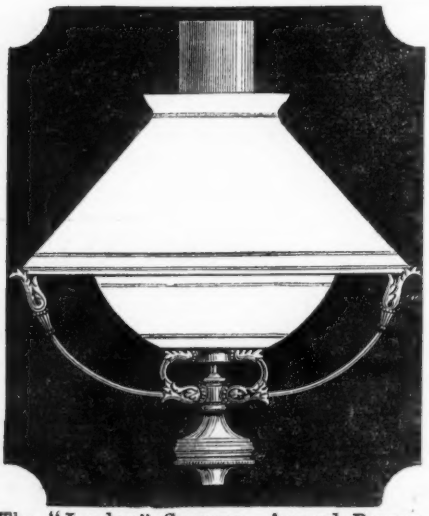
GOLD MEDAL, 1878.

TRADE MARK. EN AVANT

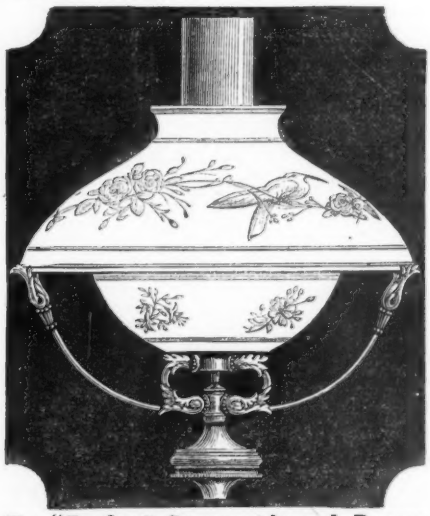
BRONZE MEDAL, LONDON, 1862.

DIPLOMA, LONDON, 1871.

THE ONLY MEDAL AWARDED FOR BURNERS, YORK, 1879.



The "London" Governor Argand Burner, Frankfort Shade and Screen.



The "London" Governor Argand Burner, Italienne Shade and Screen.

The Shades can be supplied in Plain or White Albatrine, or decorated in colours in various styles.

These Burners are made in sizes ranging from 16 to 1000 candle Illuminating Power, the larger sizes being highly suitable for the Lighting of Lecture Halls, Theatres, &c., as well as for Public Illumination, in specially-constructed Lanterns, as set forth in my Improved System of Street Lighting.

For Particulars, Lists, Photos, &c., apply to

WILLIAM SUGG, ENGINEER, CHARING CROSS, & VINCENT WORKS, WESTMINSTER.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

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It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

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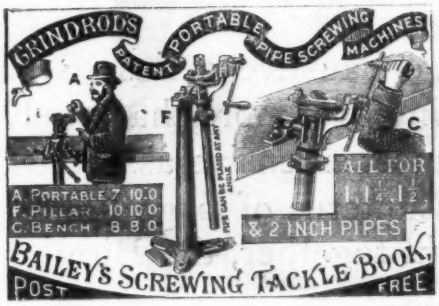
FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.



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SIMPLE & STRONG,
WITH NO MYSTERIOUS VALVES.
W.H. BAILEY & Co. HYDRAULIC ENGINEERS
ALBION WORKS, SALFORD, MANCHESTER.

Prices of Bailey's Double-Acting Steam-Pumps.

No.	Diameter of Steam Cylinder.	Diameter of Pump.	Length of Stroke.	Gallons pr. Hour. Approx.	Price.
	Inches.	Inches.	Inches.	At Slow Speed.	£
A 1	4	2	6	850	18
B 2	6	3	10	1,940	25
C 3	6	4	10	2,000	30
D 4	8	4	10	3,150	40
E 5	6	6	10	7,200	40
F 6	8	6	10	7,200	50
G 7	10	6	12	7,200	60
H 8	8	8	10	14,000	65
I 9	10	8	12	14,000	75
K 10	12	8	15	14,600	90
	10	10	15	21,000	110
	12	10	15	21,000	125

NOTE.—*At quick speed these pumps will generally deliver double the quantity specified.*

BAILEY'S HOT-AIR ENGINES,

From ¼-horse to 4-horse Power. Particulars on application. We also make Hot-Air Pumping Engines, and every description of Hydraulic Work.

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Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

W. PARKINSON & CO.,

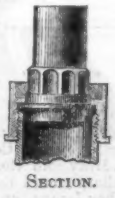
SOLE AGENTS FOR AND MANUFACTURERS OF

FOULGER'S PATENT SEAL UNIONS,

As Supplied to The Gaslight and Coke, Commercial, South Metropolitan, and other Companies.

These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas can be obtained unregistered, without destroying the Company's Seal.

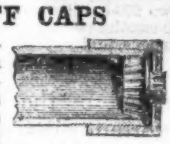
In fixing the Union (one being required on the main cock and another on the inlet only), some molten sealing-wax is poured into the recess on cap, and whilst hot impressed with Foulger's patent tong-shaped die, having the Gas Company's title engraved thereon; the wax being forced into the flutings on the lining, instant destruction of the Seal accompanies any attempt at disconnection.



SECTION.

FOULGER'S PATENT SEAL CUTTING-OFF CAPS

Cannot be taken off without destroying the Company's Seal. A tapered fluted plug (having been white-leaded or puttied) is inserted in the service-pipe. The cap (already filled with sealing-wax) is then screwed over, and tightens on a washer on the flange of plug. The wax is then warmed, and stamped with the engraved die. Absolute security against fraud and escape is thus obtained.



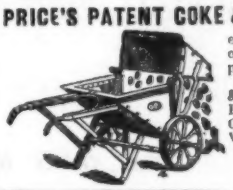
SECTION.

A great advantage will also be recognized in stopping the gas instantly with the plug, and consequent immunity from the present source of danger occasioned by escape during fitting the ordinary cap, frequently in a confined position, and often occupying a considerable time.

Small additional cost over existing connections.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

BRAY'S

PATENT LANTERN AND FLAT-FLAME BURNERS.

80-CANDLES POWER. Scale 1 inch to foot.
To be Lighted by ordinary Torch, or one Flash Jet.
Arrows show direction of regulated Column of Air.

The understated declaration with which we introduced our apparatus has been fully borne out by general experience—namely, that

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

BIRMINGHAM LAMP TESTS

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candle power Lanterns of medium lighting power are immediately required.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for the sake of general efficiency. The tests further showed that our 80*-candle* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas (the quality being* 16·75—3·35 *per foot—by the standard), which was a higher result than that yielded by any other flat-flame burner, and higher than the* 80*-candle power Argands.*

NOTE.—The above is the most conclusive answer to certain misleading statements which are being made by a prominent defeated competitor.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

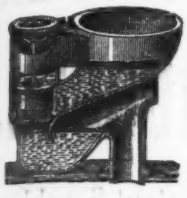
Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

Bray's Lanterns have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting; and also by about 50 Towns and Vestries, after a similar competition in most cases.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.



SMEATON'S TRAPLESS CLOSETS.

MESSRS. W. SMEATON & SONS.

HOT WATER AND SANITARY ENGINEERS.

PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.

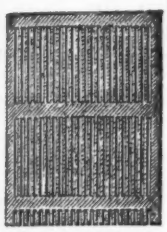
The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint. Send at once for an Illustrated Price List to their Wholesale and Retail Agent,

G. R. GLENIE,

WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, Near HALIFAX.

London Offices: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE ONLY;

ROUND STATION-METERS,

ON CAST-IRON STANDS;

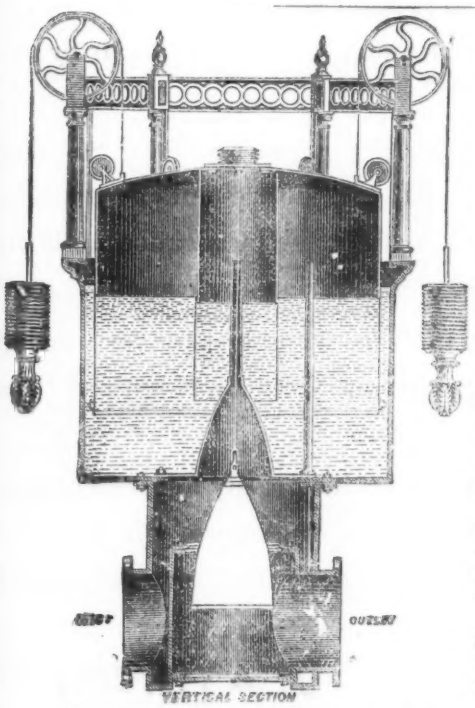
SQUARE STATION-METERS,

WITH PLANED JOINTS.

Messrs. Braddock beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, Near NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Shipments Promptly and Carefully Executed.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF
THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,

GATESHEAD-UPON-TYNE.

Are the Sole Manufacturers of

Archer's Patent Hoists,

ALSO OF

Archer's Patent Stone Breaker,

AND OF

Archer's Patent Ore Crusher & Pulveriser,

The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S

Patent Gas Calorigen,

A STOVE FOR

WARMING AND VENTILATING.

Recommended by Dr. Richardson.

Manufacturers:

J. F. FARWIG & CO.,

36, QUEEN STREET, CANNON ST., LONDON.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON
AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use. The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required. By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained. The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased. The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required. The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works. There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained. There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed. The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, Finsbury Circus, London, E.C.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

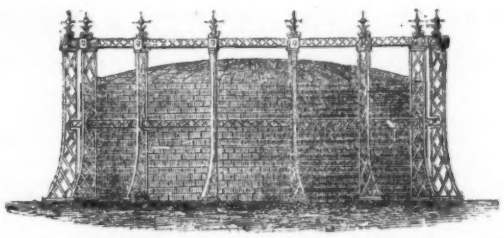
BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS, WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

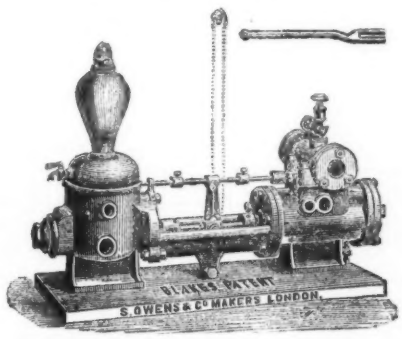
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

MR. ROMANS has for upwards of 30 years been practically engaged in th Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from Wedderspoon, Ferguson and Co., 21, Lime Street, London, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

THE MIRFIELD COAL COMPANY

are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 13,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·48.

Apply to the Mirfield Colliery, Mirfield, Normanton. London Agent: Mr. F. J. Lee Smith, 38 Throgmorton St.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to Pope and Pearson, Limited, West Riding and Silkstone Collieries, near Leeds.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, Liverpool.

BIRTLEY IRON WORKS.

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. Manwaring, 101 Cannon Street, E.C.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES.

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the Author; or at the Office of the "Journal of Gas Lighting."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

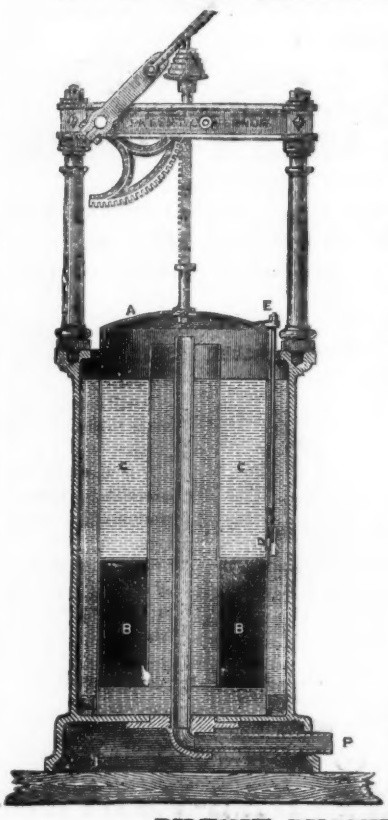
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make special Steam Throttle Valves, suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 972.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

Limited,

Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

Quotations and full Analyses will be supplied on application addressed to the Company,

LOCHGELLY, FIFESHIRE, N.B.

Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
Plesio Boghead	13,165	....	38·16	....	1632
Brown Capledrae.	12,210	....	38·46	....	1610

MESSRS. FLETCHER, BURROWS, & CO.,

ATHERTON COLLIERIES, near MANCHESTER,

ARE PREPARED TO MAKE CONTRACTS FOR THE SUPPLY OF

CANNEL AND OF THEIR ARLEY MINE GAS COAL,

WHICH ARE OF ACKNOWLEDGED EXCELLENCE.

Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise 2000 tons per day of REAL OLD SILKSTONE GAS COAL.

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

REAL OLD SILKSTONE GAS COAL.

C. A. HAWORTH & COY.,

STANHOPE SILKSTONE COLLIERIES,

SILKSTONE, NEAR BARNSLEY,

Are prepared to supply their celebrated Real Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

ALBERT USHER, 5 Office, Finsbury Park, London, N.

THE BLAINSCOUGH HALL COLLIERY COMPANY.

BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from Gas Companies and Managers, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, CHORLEY, Lancashire.

Waggon address, COPPULL SIDING, near WIGAN, London and North-Western Railway.

SAMPLE QUANTITIES SENT ON APPLICATION.

NEW PATENT WET GAS-METER,
THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.

WET & DRY GAS METERS.

STATION METERS AND GOVERNORS.

JONES'S THROTTLE-VALVE GOVERNORS.

JONES'S DISTRICT GOVERNOR,

The simplest and best Instrument extant for checking Excess of Pressure in hilly districts.

GAUGES AND TESTING APPARATUS OF ALL KINDS FOR GAS.

55, 55a, & 56, MILLBANK STREET, LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

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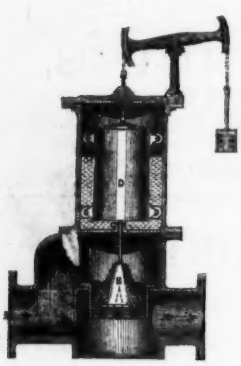

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